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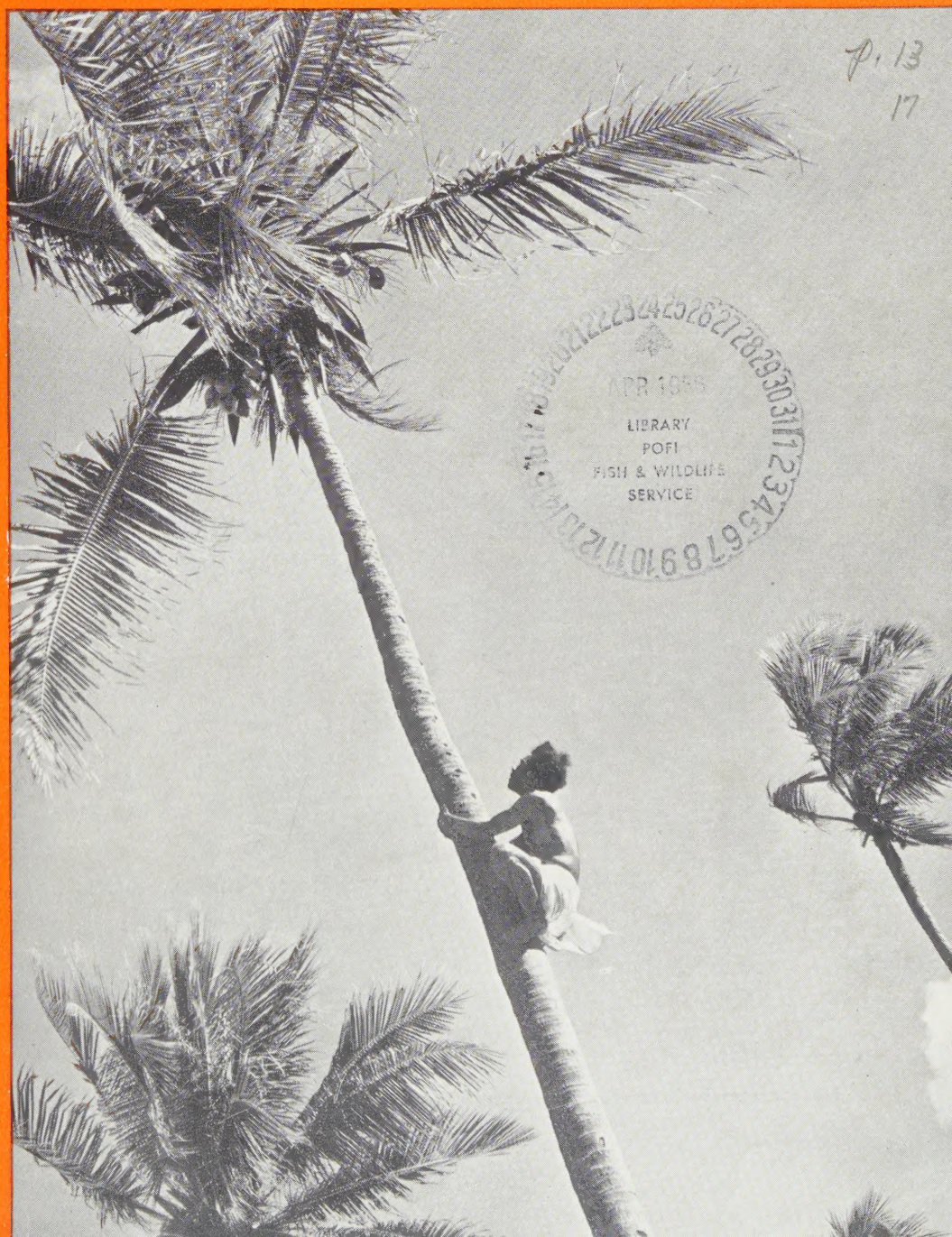

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The South Pacific Commission

The South Pacific Commission is an advisory and consultative body set up in 1947 by the six Governments responsible for the administration of Island Territories in the South Pacific region (Australia, France, the Netherlands, New Zealand, the United Kingdom and the United States of America).

The Commission's purpose is to recommend to the member Governments means of promoting the well-being of the people of these territories. It is concerned with social, economic and health matters. Its headquarters are at Noumea, New Caledonia.

The Commission consists of twelve Commissioners, two from each Government. It normally holds one Session each year. There are two auxiliary bodies, the Research Council and the South Pacific Conference.

The Research Council assembles once a year. Members are appointed by the Commission, and are selected for their special knowledge of the questions with which the Commission is concerned, and the problems of the territories in these fields. The chief function of the Research Council is to advise the Commission what investigations are necessary. Arrangements to carry out those that are approved are the responsibility of the Secretary-General and other principal officers.

The South Pacific Conference, which meets at intervals not exceeding three years, consists of delegates from the local inhabitants of the territories, who may be accompanied by advisers. The first Conference was held in Suva in April, 1950, and was attended by delegates from fifteen territories and from the Kingdom of Tonga. The second Conference was held at Commission headquarters in April, 1953. The third Conference will be held in Suva in April, 1956.

The Commission's secretariat includes six principal officers, as follows: Secretary-General, Dr. Ralph Clairon Bedell; Deputy Secretary-General, Mr. John Ryan; Executive Officer for Health, Dr. E. Massal; Executive Officer for Economic Development, Dr. A. H. J. Kroon. The posts of Deputy Chairman of the Research Council and Executive Officer for Social Development are vacant temporarily.

Further particulars of the Commission's activities may be obtained from the Secretary-General, Nouméa, New Caledonia.

NOTE: A map on which the Commission area is delineated appears on the inside back cover.

FRONT COVER PHOTOGRAPH

Both as a cash and a subsistence crop, the coconut palm is of basic importance in the economy of the South Pacific islands, where it is generally known by its Polynesian name of *niu*. This Papuan study is by Australian Official Photographer W. Brindle.

SPC QUARTERLY BULLETIN

VOL. 6. NO. 1. JANUARY, 1956

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THE SPC QUARTERLY BULLETIN, first published in January, 1951, features articles on selected activities in the Commission's three main fields of operation: economic development, health and social development. Articles are also contributed by specialists working in these and related fields, in the territories within the Commission area.

THE BULLETIN is given selective world distribution to people and institutions in widely differing fields sharing a common interest in the purposes and work of the Commission. It is published in two editions, English and French.

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Commissioners and advisers in attendance at the fourteenth session. Left to right, front row: A. F. R. Stoddart, U.K.; K. A. Ryerson, U.S.A.; C. G. R. McKay, N.Z.; F. M. Keesing, U.S.A.; R. Lassalle-Sere, France (Chairman); J. R. Halligan, Australia; H. J. Levelt, Netherlands; J. A. van Beuge, Netherlands; D. S. Reid, N.Z. Second row: H. H. Vaskess, U.K.; J. R. Petherbridge, Australia; J. Wain, Australia; A. Loosjes, Netherlands; R. S. Herman, U.S.A.; R. C. Bedell (Secretary-General); R. Pons, France; E. Barr, U.S.A.; W. E. H. Stanner, Australia; J. S. Cumpston, Australia. (Absent: M. H. Bonneaud, France; F. Bugnicourt, France; J. Guiart, France; D. Montenegro, U.S.A.)

Commission Holds Fourteenth Session

REVIEWS PROGRESS: PLANS 1956 ACTIVITIES

By RALPH CLAIRON BEDELL*

THE annual meeting of the South Pacific Commission opened at headquarters in Nouméa on October 24th and closed on November 9th, 1955. This was the fourteenth session held since the Commission was established in 1947.

The Chairman was Monsieur R. Lassalle-Séré, Senior Commissioner for France, who presided over all meetings of the Committee of the Whole and Plenary Sessions of the Commission. In his opening address he stated: "A vast movement is under way at the present time toward the achievement of human solidarity and the South Pacific Commission is playing an essential part in this work . . . It is the duty of the more advanced nations to devote their efforts to improving living standards among peoples less fortunate. It is comforting to realize that this responsibility has now been assumed."

The Secretary-General in his report emphasized the value of the friendly spirit and co-operative effort that exists among the six participating governments and their territories in the South Pacific. "The South Pacific Commissioners," he said, "may well take a large measure of credit for this, since they are the ones who throughout the years have carried major responsibility for the practical and effective methods of co-operation at the highest level of the Commission. Their influence reaches throughout the South Pacific."

South Pacific Conference

The Commission approved the arrangements for the Third South Pacific Conference to be held at Suva, Fiji, beginning on April 23, 1956, and voted a budget up to £14,000 for the purposes of the Conference. The Conference will be attended by delegates from the territories of the participating governments in the South Pacific. It will be held at the Nasinu Teachers' Training College near Suva.

Health

NUTRITION PROGRAMME: In May, Dr. H. A. P. C. Oomen, physician-nutritionist, joined the Commission's team of specialists working with the territories on the major problem of improving infant and adult nutrition in the South Pacific. During the year the team's dietitian, Miss Sheila Malcolm, completed five years of special field studies on infant nutrition and maternal welfare in the region. Next year the Commission will publish a report surveying the results of her work.

HEALTH EDUCATION: Health education was given strong encouragement in the Commission programme for 1956 and 1957 with the suggestion that there be exploration in principle for the institution of a short training course in health education in 1957. Visual aids, including posters, filmstrips and flannelgraphs, have contributed greatly to health education programmes during the past year. Specimens of these items are sent to territorial authorities, who can obtain them in large supplies.

MALARIA AND FILARIASIS: Dr. M. O. T. Iyengar, research specialist in mosquito-borne diseases, will continue his work during 1956. In Western Samoa during 1955 he worked out a filariasis control programme, later accepted by the administration. A treatise of world interest to specialists in the field by Dr. Iyengar on mosquito fauna of the region, has been published in the Commission's Technical Paper series.

Economic Development

COCONUT BEETLE: The Commission

* Secretary-General, South Pacific Commission.

Dr. Bedell addressing the opening meeting of the fourteenth session. The Chairman, Monsieur Lassalle-Sere, is seated at right. Mme. G. Barrau, Chief Interpreter for the Commission, is interpreting.

stepped up its campaign against the coconut beetle (*Oryctes rhinoceros*), and recorded its appreciation of a grant of $47,000 made by the Rockefeller Foundation to aid in investigations on this serious pest.

Since 1954 two Commission entomologists, one in South East Asia, the other in Western Samoa, have been searching for insect predators and parasites of the beetle, and studying control measures. The Rockefeller Grant makes possible further explorations by an additional entomologist into the possibility of controlling the rhinoceros beetle through infectious diseases.

FISHERIES TRAINING CENTRE: The Commission approved co-sponsorship with the Food and Agriculture Organisation of a training course for islands fishermen in 1956. The purpose is to provide additional skilled personnel, thus enabling territories to develop further their fisheries resources and services.

The Commission's Fisheries Officer, Mr. H. van Pel, visited seven territories during the year to study their fisheries problems. In the Cook Islands he supervised the construction of freshwater fish ponds that were stocked with tilapia fingerlings sent by air from Fiji. A fast-growing fish of tropical origin, tilapia thrives equally well in fresh, brackish or salt water, and provides a cheap and plentiful source of animal protein. Its introduction to other territories is expected.

Work in fisheries in 1956 will follow the present pattern. Mr. van Pel will assist in research now being conducted in the Trust Territory of the Pacific Islands and New Caledonia. Research on trochus will be continued.

SUBSISTENCE ECONOMIES: Approval was given for the continuation of studies of subsistence economies during 1956. Mr. J. Barrau's report on subsistence agriculture in Melanesia was authorized for publication. It is anticipated that the results of his further work on Polynesia and Micronesia will be published in 1957.

PLANT INTRODUCTION: In Canberra last May a Commission-sponsored conference was held on plant collection and introduction in the Pacific. Its report and recommendations will form the basis for future work in this field in the region. The Commission regards the introduction of new economic plants in the region as of major importance. As its main activity in this field it makes an annual contribution to the plant introduction station at Naduruloulou, near Suva, Fiji.

Social Development

LOCATION OF SECTION: The Commission decided that the Executive Officer for Social Development, the Co-operatives Officer, and the library hitherto maintained in Sydney should be located at headquarters in Noumea.

LITERACY: During the year the Adviser on Literacy, Dr. K. Neijs, completed his experimental field work in Papua and New Guinea, and it is anticipated that his final report and collection of sample teaching materials will be ready for publication in 1956.

BOOKS FOR ISLANDERS: This year many thousands of copies of specially-written books and pamphlets reached people in the islands through the efforts of the Literature Bureau, whose main task it is to encourage publishers to serve this special field.

The 17 publications issued under Bureau sponsorship included a booklet of special importance, *Wealth from the Coconut*, by W. V. D. Pieris, published in English, French, and several vernacular editions. It is a well-illustrated, authoritative handbook on coconut cultivation written in simple, clear style.

The Bureau also promotes territorial bookselling and library services, working mainly through special literature committees in the islands. It assists territories wishing to establish their own literature bureaux.

AUDIO-VISUAL AIDS: A wide variety of visual aids material was issued during the year to assist territories planning visual education programmes. Posters, filmstrips and flannelgraphs are produced on such topics as rhinoceros beetle control, soil erosion, coconut cultivation, filariasis control, care of the teeth, and baby feeding. Copies are sent to authorities throughout the region.

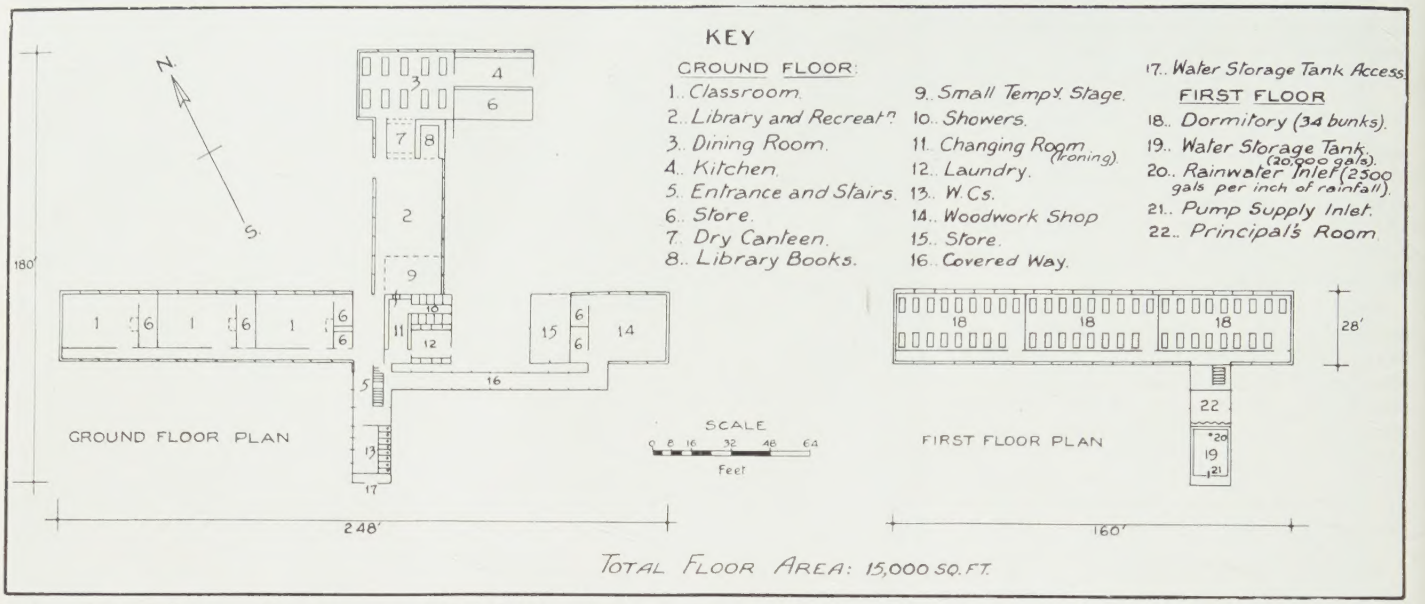
CO-OPERATIVES OFFICER: An expert has been engaged to advise territorial administrations desiring assistance in promotion of co-operatives. He is Mr. C. G. Joannides. A meeting of islands co-operative officers will be held under Commission auspices in 1957.

Budget

The Commission approved for 1956 the largest annual budget in its history, the total contributions by participating governments being somewhat under £200,000 sterling, with additional funds from other sources. The budgeted amounts will be used to furnish personnel and equipment for the programmes approved, for the South Pacific Conference, and for the maintenance of the facilities of the Commission.

PROCEEDINGS OF THE FOURTEENTH SESSION

This Summary gives the highlights of the Fourteenth Session of the South Pacific Commission. Full details are in the PROCEEDINGS, *which may be obtained from the South Pacific Commission, Box 5254, G.P.O., Sydney, price 2/- stg. or 30 cents U.S. per copy post free by surface mail.*



Design of the College provides for a central block housing classrooms, library and dining hall on the ground floor, and three dormitories and principal's room on the first floor.

New Training College For Solomons

A combined teacher and vocational training institution will shortly be erected near Honiara, capital of the British Solomon Islands Protectorate. Details are given below.

THE development of vocational training in the British Solomon Islands Protectorate will be greatly assisted by the new Teacher and Vocational Training College to be established near Honiara. The building and equipment of the College have been made possible by a grant under the Colonial Development and Welfare Scheme. An application for additional funds to meet recurrent costs will be made at a later date.

The site selected for the buildings is six miles from Honiara, on a ridge overlooking the present airfield at Kukum. It is close enough to Honiara to permit easy access and administration, and it also provides the rural environment desirable for training teachers to work in villages, and for conducting agricultural courses. The students will also be able to maintain gardens for production of foodstuffs.

The Government Architect's design provides for a central block with three classrooms, stores and washing facilities on the ground floor, and three dormitories with double-tiered bunks on the first floor. Wings from the central block will house the technical classrooms and store and the library recreation room and dining hall, with kitchen and store attached. Water will be provided from the main Honiara supply. The buildings, which will cost nearly £A24,000, will be constructed of steel and cement. The estimates include the nucleus of a library and the necessary tools and equipment for technical and teacher training.

The technical training branch will train artisans and clerical workers, for whom there is a widespread demand in the Solomons. Because of the need for economy, the small number of pupils and the limited staff, it will not be possible to teach many skills, but it is proposed to alternate courses to extend the range of subjects.

The first two courses offered will be a general building course, including carpentry and timber and concrete construction, and a clerical course, including typing, English and bookkeeping. Trained building workers will be of considerable value to the Public Works Department, missions and other private employers, while clerical workers are urgently required in all governmental departments and business firms.

Other classes will be introduced later in metal work, electricity, wireless operation, etc. Courses will also be provided in the maintenance of marine and car engines, and for the training of shipwrights and deck officers. The technical courses, which will last two years, will start with an annual intake of twenty-five students, to be increased to thirty in the fourth year. The manual training group will be under the control of the Supervisor of Technical Training, and the clerical class, the Supervisor of Secretarial Training. Both groups will be under the general direction of the Principal.

Teacher Training Course

The teacher training course will also last two years. The first will begin with an intake of ten students, to be increased to fifteen in the second year and to twenty in the third year. At the end of four years the teacher training wing will reach its maximum of forty students.

The course will be largely concerned with basic teaching methods and subject matter, with frequent observation and practice in selected schools, of which four are available in the vicinity of Honiara. Attention will be given to the making of classroom apparatus and teaching aids, with particular reference to local environment.

The teacher training section will be under the direct control of the Principal, who in the second year will be assisted by a lecturer. Prospective teachers will have to give an undertaking to teach in Protectorate schools.

While the College will be undenominational, the missions have been fully consulted about the scheme and will be given opportunities to foster the spiritual welfare of their adherents. Throughout both the technical and teacher training courses, efforts will be made to broaden and deepen the students' general educational background.

The combination of technical and teacher training in the one institution is

primarily an administrative measure to secure economy in overheads, because the Protectorate could not support two separate institutions. However, it is felt that, as well, considerable educational benefits can result. In any case, the establishment of the College is an important step forward, because there has previously been no technical or teacher training institution in the Solomon Islands.

The missions have trained their own teachers and several have provided some technical instruction, but Government teacher training has been limited to sending students to Nasinu College in Fiji. There have been no government facilities for technical training. The standard of entry into Nasinu is too high for more than one or two students from the Protectorate each year, and even then they are usually far behind the Fijian students.

It is felt that the immediate requirement is a larger number of teachers, even if the high standard of Nasinu cannot be achieved for many years to come. A further advantage of a local institution under the control of the Senior Education Officer is that training courses can be better adapted to equip students for teaching in the villages of the Protectorate than would be possible in Fiji.

In this experiment to determine the rate of growth of trochus, each live specimen is tagged with a copper rivet inserted in a hole drilled in the lip of the shell. While the rivet is soon covered up inside the shell by a layer of mother-of-pearl, it remains easily discernible outside.

Trochus Study By French Institute

Of significance to territories planning to expand their trochus shell industry is the research project being carried out by the French Institute of Oceania, Noumea, and described below by

LOUIS DEVAMBEZ*

IN the Commission area, fishing for trochus is carried on in varying degrees in New Guinea, the Solomons, New Hebrides, New Caledonia and the United States Trust Territory of the Pacific Islands. While not as valuable as the mother-of-pearl oyster, trochus is nevertheless an important export item in several of these territories.

Recent investigations by Mr. H. van Pel, the Commission's Fisheries Officer, seem to indicate a possibility of introducing this marine snail in some territories where it now does not exist. It is therefore of great interest to know precisely what are the life habits of the trochus. This knowledge will make it possible to define the protection measures needed to prevent exhaustion of stocks and thus ensure continuity of the industry. It will also be possible to make efficient transplantings, leading to the enrichment of lagoons now lacking in shell of commercial value.

The *Institut Français d'Oceanie* of Nouméa is devoting attention to the various problems associated with trochus fishing in New Caledonia. A marine biologist of this institution has already spent several months carrying out a research project, which will probably extend over three years.

The research programme includes two parts; biological research, and the study of all aspects of the trochus industry.

Biological Research

This part of the project will cover essentially the distribution, growth and reproductive activities of trochus, as well as influence of environment. These investigations will be carried out on the barrier reef that extends in an almost continuous belt around New Caledonia.

Experiments have already been carried out with a view to determining the growth rate of trochus. The method which has so far given the most spectacular results is the tagging of trochus by means of a small rivet inserted near the mouth of the shell. The animal does not seem to suffer from this operation, and the rivet, which remains easily discernible on the outside of the shell, is soon covered with a mother-of-pearl layer inside.

The trochus carries on with its shell building, and the growth of the shell over a given period can thus be established with sufficient accuracy.

Study of the Industry

Intensive fishing practices have had a considerable influence on the trochus population. Fishing was originally carried out on foot, at low tide; it now requires good divers, and the numbers of trochus gathered are much less than they were.

The study of the industry will cover, among other subjects, the fishing areas, boats, production, transformation of raw shells into buttons, and regional and world markets.

Need for Further Research

Studies on trochus have already been carried out in New Caledonia by J. Risbec in 1930, and more recently by R. Catala. Both state that further research is necessary.

The work of the *Institut Français d'Oceanie* should make a valuable contribution to the knowledge of trochus, not only in New Caledonia waters, but also, allowing for different conditions, for the entire Pacific.

Similar work is being undertaken in the Palau Islands by Mr. John A. McGowan, an American marine biologist. Close liaison will be maintained between the two research workers; the results of both projects will help to form a more complete picture.

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* Economic Development section, South Pacific Comission.

Above: Musa nana or "fai papalagi". Upolu, Western Samoa. Right: Bananas growing on an atoll of the Tokelau group. Note the coconut husks heaped at the foot of each banana tree.

Pacific Subsistence Crops . . .

THE BANANA

The eighth of a series of articles on subsistence food plants in the South Pacific

By EMILE MASSAL and JACQUES BARRAU

Executive Officer for Health, South Pacific Commission — Subsistence Agriculture Officer

THE banana tree is one of the oldest cultivated plants and its fruit was probably among the first foods of men. Today it is found on all the South Pacific islands, with the exception of some atolls. The banana tree is exploited either by simply gathering its fruit or by growing under cultivation, with all the intermediate stages between these two systems. The banana is a staple food in most of the high islands of Polynesia and in some parts of Melanesia such as the Markham Valley of New Guinea. In some of the South Sea territories, such as Fiji and Samoa, it is now an important cash crop and large quantities of fruit are exported to New Zealand.

The banana trees of the South Pacific belong to different botanical species: some are indigenous, others were introduced either before or after the coming of the European.

The true indigenous species of banana are found mostly on the continental islands of the Western Pacific. Thus, *Musa Peekelii,* Leuter, which bears an erected bunch with non-edible fruit full of seeds, is frequently found in a wild state in the coastal area of the Morobe District in New Guinea. Among other indigenous species is *Musa Tikap,* Warb., of the Caroline Islands. The only one of these South Sea bananas which has an economic interest is *Musa troglodytarum,* S. Kurz. not Lour. (*Musa Fehi,* Bertero), the "fe'i" of the Tahitians, which, as a matter of fact, is quite probably indigenous to the continental islands of Melanesia. In the Solomons, New Hebrides and New Caledonia, seed-bearing varieties of this species can be found in a wild state. Guppy, in his "Observations of a Naturalist in the Pacific Between 1896 and 1899", London, 1906, had classified this species as a pre-Polynesian food plant and, more recently, Professor MacDaniels wrote that its introduction into the Polynesian islands from the Western Pacific could have occurred before the Christian era.

The main economic species of banana found today in the South Sea islands is *Musa paradisiaca,* Linn. which, according to many native legends, seems to have been introduced into this part of the world in the olden times. This species is probably indigenous to the Indo-Malayan area. Several sub-species are commonly distinguished by botanists, the main ones being:

—*Musa paradisiaca,* L. subsp. *normalis,* O.K. or plantain, the fruits of which must be cooked before eating;

—*Musa paradisiaca,* L. subsp. *sapientum* (L.) O.K. which bears the common banana.

Left: Bunch of Musa paradisiaca seminifera or "fai taemanu", Upolu, Western Samoa. Several bananas have been cut to show the seeds. Centre: Musa paradisiaca, "fai" in Samoan, var. "Vaivaileta", Upolu, Western Samoa. Right: Musa troglodytarum, or "Soa'a", Upolu, Western Samoa.

Some botanists do not accept this classification, and consider *Musa paradisiaca* and *Musa sapientum* as two separate species.

In New Caledonia and the Loyalty Islands, a sterile variety, *oleracea*, Baker, of the sub-species *sapientum*, (L.) O.K. is grown for its fleshy rhizomes, which are eaten. In the native gardens of these territories, another species described as *Musa discolor*, Horan, is found which bears purple fruit of excellent flavour.

Finally, a wild form of *Musa paradisiaca* with non-edible fruit full of seeds is found in the forests of Samoa and of New Caledonia. This is the sub-species *seminifera*, Baker.

Introduction Of Chinese Banana

After the arrival of the European in the South Seas, several varieties of *Musa paradisiaca* and of *Musa nana*, Lour., Chinese or Cavendish banana, were introduced. The story of the introduction of the Chinese or Cavendish banana, indigenous to Asia, must be told here.

One of the early Christian missionaries in the South Pacific, the Reverend John Williams of the London Missionary Society, during one of his stays in England in 1835 paid a visit to the Duke of Devonshire at his Chatsworth estate. In his glasshouses the Duke grew many tropical plants which explorers sent him from various parts of the world. He showed Reverend Williams a new species of banana which he had just received from China, and when Williams left England in 1839 to return to the South Seas he took with him several suckers of the new banana. When he arrived in Apia after a nine months' trip, all the suckers looked dead. They were to be destroyed when one of the Reverend Williams' colleagues, the Reverend Mills, found that one seemed to be still alive. It was planted, grew, and later suckers of this species were distributed by the London Missionary Society in many South Pacific islands. Thus the Reverend Pritchard brought it to Fiji in 1848.

During the last century the London Missionary Society in Samoa was an active centre of distribution of economic plants. As an indirect result of its action, today it is possible to find in the majority of South Pacific islands banana varieties called "Samoa" or "Hamoa" as well as breadfruit and taro varieties.

During the last century the introduction of new banana varieties, particularly into the Western Pacific islands, was also effected by natives "recruited" to work on the Queensland plantations. Some of them returned to their islands with banana suckers and other economic plants. Thus in the New Hebrides it is possible to find today banana varieties of which the native name is just a corruption of either Sydney or Brisbane.

It could be of interest in the same field to consider the names given by the islanders to the introduced banana varieties. Sometimes they are quite simple and mean only the bananas brought by the Europeans. Thus in Fiji this is the meaning of the name "vudi ni vavalagi" as in Samoa "fai papalagi". More curious is the name given to the new bananas by the Loyalty islanders "wa-wi-wi" which means bananas of the "oui-oui", nickname given to the Frenchmen for the exaggerated use they made of the affirmative "oui". In some parts of New Guinea some of the introduced bananas are called "Obomp bomp" by onomatopoeia with the noise of gun firing largely used at the beginning by the European conquerors.

Today banana trees are present almost everywhere in the South Sea islands, but their economic importance is not the same in all the territories. Frequently bananas are only a complementary food obtained by a method of exploitation which is almost a simple gathering. In New Caledonia they are more highly cultivated, but the fruit is nevertheless just a supplement to the diet. On the other hand, in some territories bananas are a staple food. This is the case in some Polynesian islands such as the Marquesas, the Leeward Islands, Samoa and in the Markham Valley in New Guinea. As has already been mentioned bananas are grown today in Fiji and Samoa for export, and constitute an important source of cash income for the islanders. In Apia the bananas rejected by the grading officers are sold locally very cheaply, and are the main food of the urban-Samoan population.

As a general rule the cultivation of bananas by the South Sea islanders is quite simple. Suckers are planted and the trees grow without any particular care. In New Guinea and the Solomons, the bunches are wrapped in dry banana leaves as a protection against damage by birds. Frequently the bananas grow in dense, almost permanent groves which regenerate themselves by the suckers.

In these circumstances the annual yield varies according to the more or less careful type of cultivation. When only a few scattered bananas are growing on the fallow, which is generally the case when the bush fallowing rotation is used, production could be approximately half a ton of fruit to the acre. On the other hand, where banana trees are producing the staple food and are grown in true plantations, four to eight tons of fruit per acre can be obtained, representing 2,800,000 to 5,600,000 calories.

Special techniques are sometimes used to ripen the bunches. Thus, in New Caledonia, bunches of *Musa troglodytarum* are buried in mud, resulting in very rapid ripening. In the highlands of Papua, ripening of bunches of *Musa paradisiaca sapientum* is sometimes effected in the same way. In Samoa, the green bunches are dipped in sea-water and hung in the houses, where they ripen. They are also buried in pits lined with dry leaves which are sometimes

heated by burning coconut shells.

Chemical Composition

The chemical composition of the banana has been the subject of many analyses and research studies, As a matter of fact, the results presented by various authors on this matter vary to a considerable extent. Nevertheless, the following chemical composition can be considered as an average.

100 grammes of raw, ripe fruit of *Musa paradisiaca sapientum* represent 85 to 90 calories and contain:

Water	75.9 g.
Reducing sugars	10.7 „
Non-reducing sugars	6.1 „
Starch	2.9 „
Fibre approximately	1.0 „
Pectin and proto-pectin	0.7 „
Protein (N x 6.25)	1.0 „
Fat	0.5 „
Ash	0.7 „
or approximately	
Carbohydrates	20%
Protein	1%
Fat	0.5%

In the green banana the carbohydrates are mostly starches, while in the ripe fruit they are almost only sugars. In both cases the energy value is the same but, from the nutrition point of view, the sugars are directly and almost completely available while the starches need first the action of mouth and intestinal juices. They are then transformed into available glucose and their coefficient of utilization is approximately 54%.

Experiments on animals have shown the good quality of the proteins contained in the banana, but no precise data are available concerning the fats.

Ashes are alkaline, and according to V. Loesecke contain the following minerals for 100 grammes of raw pulp:—

Potassium	285 mg.
Magnesium	27 „
Phosphorus	33 „
Calcium	6.6 „
Sodium	51 „

Moreover, these ashes contain traces of iron, and other micro-elements such as copper, iodine, manganese, zinc and cobalt. This mineral composition shows that the calcium content is low, the calcium/phosphorus ratio being around 0.2. (The ratio considered as the best from the nutrition point of view is 1.5.)

As with other fruits, bananas contain vitamins. According to various authors, the following values are an average for 100 grammes of raw pulp from ripened fruits:

Vitamin A (carotene)	400 I.U.
„ B_1 (thiamine)	0.05 m.g.
„ B_2 (riboflavine)	0.08 „
„ PP (nicotine amide)	0.60 „
Panthotenic acid	0.07 „
Vitamin C (ascorbic acid)	10.00 „

This shows that bananas are a good source of provitamin A, riboflavine and nicotinic amide, while the content in Vitamin B^1 is low. The vitamin C value of the green bananas (5mg. p/100) is doubled by that of the ripe banana (10mg. p/100). Moreover, it varies with the varieties. Finally, bananas contain no vitamin K, are poor in vitamin D and contain only 0.4 mg. p/100 of vitamin E.

A banana meal being prepared for cooking. Kaiapit, Markham Valley, New Guinea.

During the ripening of the fruit, the non-soluble proto-pectin is progressively hydrolised and is replaced by soluble pectin, which seems to be very useful in the intestinal digestive process.

Well-ripened bananas of varieties producing fruit edible in its raw state are very tasty. They represent 85 calories per 100 gr. of fresh pulp and contain carbohydrates which are directly available. They are a good source of provitamin A and vitamin C, but are poor in protein and calcium. Thus, they are by no means a complete food as some advertising campaigns have tried to demonstrate. However, a mixture of a pint of milk and a raw, ripe banana constitutes a well-balanced food.

For *Musa troglodytarum*, the "fe'i" of the Tahitians, MacDaniels gave the following chemical composition for 100 gr. of dry pulp:

	Green fruit dried	*Ripened fruit dried*
Water	7.76 g.	7.54 g.
Carbohydrates	84.80 „	84.97 „
of which		
starch	51.90 „	38.47 „
sucrose	21.60 „	31.20 „
reducing sugar	11.30 „	15.30 „
Protein	2.90 „	3.15 „
Fat	1.45 „	1.40 „
Ash	3.09 „	2.94 „

The cooked fruit of the Tahitian variety of *Musa troglodytarum* called "Afara", which is considered the best, is sometimes used as a weaning food for babies.

Traditional Cooking Methods

Banana varieties can be divided into two main groups—those eaten cooked, and those which can be eaten raw when ripe, as any other fruit.

The various traditional methods of cooking bananas could be listed as follows:

—The unripe unpeeled fruit can be cooked in hot stone ovens or on embers. They can also be peeled before cooking in the oven. Sometimes in Samoa, for instance, before being placed in the oven, they are immersed in a bowl of sea-water.

—The unripe bananas can be peeled, grated and the pulp thus obtained wrapped in leaves and cooked in the oven with or without addition of coconut cream. This method is used in Samoa as well as in some islands of the New Hebrides. Slices of bananas can be cooked in the same way.

—In Samoa the fermented paste of bananas, "Masi fai", is cooked as a cake in hot stone ovens. In the same territory the ripe fruit of *Musa nana* is pounded and mixed with coconut cream scented with citrus leaves. This forms a sort of liquid mash called "Poi" which looks like a thick milk shake. It is eaten only by chiefs and is truly delicious.

—Bananas can also be mashed and cooked with starch to obtain a sort of gelatinous cake, "Poe" or "Poke", a popular food in the Cook Islands and French Oceania.

—In the European kitchen bananas are used to prepare a large number of attractive and tasty dishes.

(*Continued on Page 14*)

Fisheries Experts Meet In Tokyo

The Indo Pacific Fisheries Council, established in November, 1948, is an intergovernmental body, reporting direct to FAO on fisheries problems and related subjects. Regular yearly meetings have been held since 1949, when the South Pacific Commission was represented by its first Deputy Chairman of the Research Council, Professor L. G. M. Baas Becking. From 1950-54 the Commission had to rely on the willing co-operation of national delegates, as it was unable to send observers from among its own staff. Last year the Sixth Meeting of the I.P.F.C. was attended by the Commission's Fisheries Officer, who summarizes his observations in the following article.

By H. VAN PEL

Opening session of the sixth meeting of the Indo Pacific Fisheries Council, which met in Tokyo from September 30 to October 14 last. It was attended by delegates from 16 countries.

EARLY last year the Commission was invited to send an observer to the Sixth Meeting of the Indo Pacific Fisheries Council, to be held in Tokyo from September 30 to October 14. Accordingly, my travel schedules were re-arranged to combine this new assignment with a fisheries survey of Guam and the Trust Territory of the Pacific Islands.

Delegates from sixteen countries attended. They were divided into two Technical Committees, each comprising three panels or sub-committees. I was fortunately able to follow the discussions of both.

Many subjects were discussed, including oceanography, biology, sea and inland fisheries, fishing gear, boat building, fish marketing, and fisheries co-operatives. I was able to form a reasonably complete picture of the work done or projected in neighbouring countries. I particularly noted subjects of interest to the South Pacific area such as the tuna-tagging operations, using plastic tags, carried out by the Pacific Oceanic Fishery Investigations in a study of migration, growth and other factors. The co-operation in oceanographic investigations based in Japan, Hawaii and New Caledonia was another such subject.

The Council recommended that the spawning of Milkfish (*Chanos chanos*) in enclosed waters in Tonga be studied for the benefit of all countries where this fish is extensively raised in ponds[1]. A study of the spawning habits of the gray mullet (*Mugil cephalus*) was also recommended.

Some very interesting discussions took place on the use of synthetic fibres for nets and lines. Various statements were made on the use of light for attracting fish, and it appears that a green light, used underwater, provides the strongest attraction. Reports were read on the Japanese longline boats, the largest of which now go fishing as far as Madagascar.

It was decided that the Seventh Meeting of the Indo Pacific Fisheries Council would be held in Indonesia. Dr. Shri N. K. Panikkar, of India, was elected Chairman of the Council for next year.

During the meeting an exhibition was held in the same building, and a number of firms displayed such an array of nets and ropes made of synthetic fibres as would delight any fisherman's heart. The Director of Fisheries told me that Japanese fishermen have been switching over to synthetic fibres since 1950, and it is expected that within two years the whole of the Japanese fishing fleet will use only synthetic yarns, nets and ropes.

All sorts of fish detectors—echo-sounders as well as oceanographic and limnologic instruments—were on display, together with diving equipment, engines, fishing gear, etc.

Several tours organized by the Japanese Government for delegates proved of the highest interest. One was a visit to the Tokyo University of Fisheries, founded in 1889. The present staff includes 28 professors, 25 assistant professors, 15 instructors, 11 assistants, 27 part-time instructors, 202 secretaries and services staff. 904 students are registered at the University, the faculties

[1] See **S.P.C. Quarterly Bulletin** for January, 1955 "Milkfish Are Breeding In Lake Ano Ava" by H. van Pel.

The "Umitaka Maru", training and research vessel owned by the Tokyo University of Fisheries, which was visited by delegates.

being fishing, fisheries technology and pisciculture.

The University has three ships. The largest, *Umitaka Maru*, is a steel training and research vessel of 1,387 tons gross, powered by a 2,100 h.p. diesel engine. Her full complement includes 15 officers, 7 teachers, 36 crew and 60 cadets, a total of 118. In addition, the University has numerous specialized training stations and research laboratories.

A separate Government service, the Fisheries Agency, operates regional fisheries research laboratories and technological research sections.

Misaki harbour, famous for its long-liners, was also visited. The delegates had the opportunity to see a new long-liner, ready for a three-months fishing trip to the Indian Ocean, in the vicinity of Madagascar.

In the fishing harbour of Funabushi I saw some 2,500 small wooden fishing boats, mostly equipped with a diesel engine and a movable propeller which can be raised when passing over shallows. The propeller shaft is fitted with a universal joint at a point just outside the hull and the propeller and part of the shaft can thus be lifted to avoid damage. Such a boat would be a great help in some South Pacific islands which have no harbour, or in places where a bar lies across a river mouth.

During my stay in Japan, I was able to collect a large number of technical papers which will be of great value for the S.P.C.-F.A.O. Fisheries Training Centre to be held in Nouméa at the end of 1956.

Suva Conference On Vocational Training

A CONFERENCE was held in Suva, Fiji, from May 4-6 last on the proposed establishment of a central vocational training institution to serve the needs of territories within the South Pacific Commission area.

Plans for a central institution in Suva were first submitted to the Commission in 1953 by Dr. F. J. Harlow, Adviser to the British Colonial Office on technical training problems. At their twelfth session in October, 1953, the Commissioners recommended that governments interested in the establishment of such an institution might hold discussions on Dr. Harlow's proposals. The Government of Fiji suggested Suva as the meeting place. For various reasons the conference was postponed until May, 1955.

Delegates were present from Australia, Fiji, New Zealand (including one from the Western Samoan administration) and the United States, and an observer attended from the United Kingdom. The Governments of France and the Netherlands declined invitations to send delegates, and the High Commissioner for the Western Pacific and the Government of Tonga were unable to send observers.

The conference considered the various aspects of the Harlow proposals, especially the problem of fitting a central institution into the educational plans of the individual administrations, and finally agreed that the proposals should not be proceeded with. Some of the objections made by the delegates were the expressed preference of the Governments represented and of the French Government to make their own arrangements for vocational training; the fact that training schemes were already in progress in the individual territories; the diversity of conditions in the area; the administrative problems of a central institution embracing such diverse programmes of study as recommended by Dr. Harlow (one delegate pointed out that the ages of students would range from about 15 years to 30 or more); the high cost of establishment and maintenance, and the difficulties of staffing.

The conference recommended that the territories develop their own programmes of vocational training and that the facilities in the metropolitan countries represented in the South Pacific Commission be made available as freely as possible to all island students. It also suggested a regular exchange of information and ideas between officers concerned with technical training in each territory, and after a suitable period, an assessment, under the aegis of the South Pacific Commission, of the success of these training programmes.

With regard to this last recommendation, the Commission at its thirteenth session decided to conduct a small clearing house service designed to promote the supply and exchange of teaching aids suitable for use in vocational training in South Pacific territories. A collection of simple text-books, filmstrips, posters and charts, mainly on trade subjects, is now being made and technical training officers in the Pacific territories will be kept informed regarding available materials. It is hoped that at the same time they will supply copies of any locally-produced teaching materials. Educational authorities in the Pacific have welcomed this clearing-house service and have expressed their willingness to co-operate in the exchange of materials.

The conference also expressed its appreciation of the value of the Harlow Report and of the earlier Derrick Report on vocational training, because they had made an important contribution to the knowledge and awareness of the problems of technical education in the South Pacific area and had provided a stimulus to thought and action in this field. This view is certainly borne out by the number of new technical training institutions which have been established in the Pacific in recent years and by the expansion of existing training programmes.

Pacific Subsistence Crops

(*Continued from Page 12*)

It may be of interest to quote a French writer, Boussingault, who wrote about these dried bananas as follows, in 1843:

"Dried banana was hard, crisp, translucent and looked like horn . . . I travelled once in the South Seas on a ship where dried banana was given as food to the crew instead of biscuits."

As a matter of fact, the dried bananas as now prepared in Tahiti are softer and have a characteristic caramelized appearance.

More curious is the preservation of the fermented paste of bananas, "masi fai", which is still used in Eastern Samoa. This technique is similar to the preservation of breadfruit by fermentation which has been already described.[1]

Banana growing in the South Pacific Islands is of interest in many respects. In Fiji and Samoa, the growing of bananas as a cash crop has developed. The fruit is exported to New Zealand and this production plays an important part in the economy of these islands. However, bananas still retain an important place in the islands' subsistence economy in some cases as a staple food and in others as an important complementary food.

For these reasons further research on bananas must be done in the South Pacific islands on better methods of cultivation, preservation, utilization and transportation.

[1] E. Massal and J. Barrau, "Breadfruit", *S P C Quarterly Bulletin*, October, 1954.

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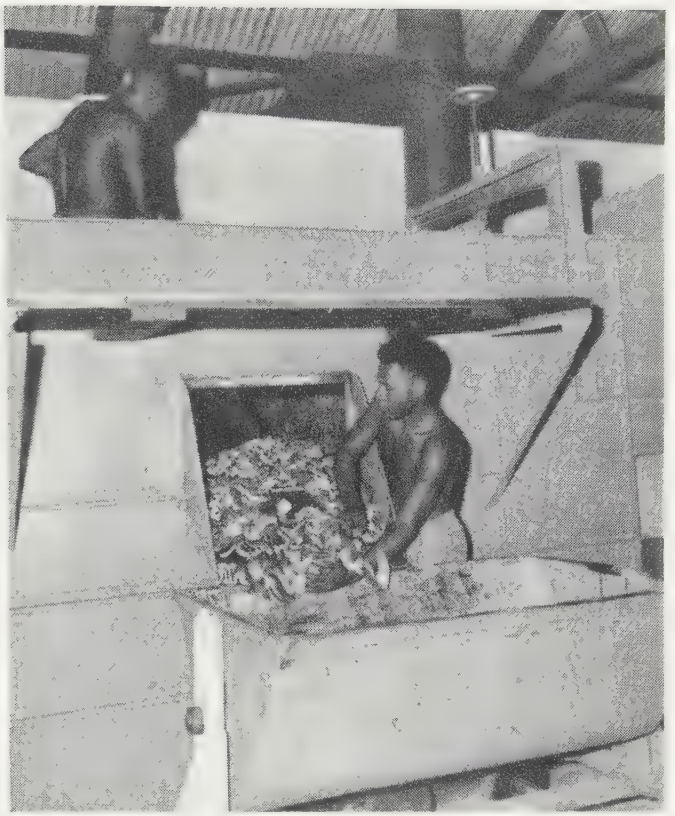
The plan for stepping-up copra production includes the training of selected natives in various phases of the industry, including the operation of driers. Here copra is being removed from a Chula hot-air drier, which can dry two tons of copra a day. It is being operated on Bolegila Plantation New Ireland, owned by Mr. E. Stanfield.



Stepping-Up Copra Production In Papua and New Guinea

A plan of action has been officially approved for the maintenance and further development of the coconut industry in Papua and New Guinea.

THE coconut is the most important cash crop in the territory. Copra production in 1954-55 was about 97,000 tons, valued at about £7,000,000. Natives produce about 20,000 tons annually.

Many coconut palms have, however, reached an age when yields decline. There is also room for improvement of the product, particularly by the adoption of better production methods and drying techniques.

The main points of the plan are:

Establishment of new coconut areas on suitable lands;

expansion of existing coconut plantations where unplanted land is still available on existing leases;

replanting of old and declining areas on existing plantations where land is suitable for coconuts;

interplanting of coconuts with cocoa on suitable land where the practice would be advantageous;

use of livestock on plantations where suitable; and,

intensified research, experimental and investigational activities.

To encourage new plantings and the replanting of declining stands of coconuts the Department of Agriculture in the territory will establish selected seed gardens at strategic points for distribution of seed nuts to planters and native growers. To encourage improved methods of plantation maintenance, demonstration plots will be established to show the value of cover cropping and to carry out tests on mechanical grass control, surface and deep cultivation, control of pests, fertilisers, and grazing for grass control. Investigations will be undertaken on mechanical de-huskers and on various types of copra driers.

An important recent development is the interplanting of cocoa with coconuts in suitable areas of Papua and New Guinea. The Department of Agriculture will intensify investigations into the practice of inter-cropping.

The extension services of the Department of Agriculture will encourage native coconut producers to adopt a high standard of plantation hygiene to reduce the dangers of insect infestation, and to use cover crops to build up soil fertility. The

A typical territory plantation in full production. Constant clearing of secondary growth is a significant item in maintenance. Pre-war herds of cattle kept to assist in this purpose, and to supply meat for native labour, were almost wiped out during the war. They are now being built up again.

natives will be encouraged to plant more palms, both for food and as a cash crop.

Planting distances will be selected to enable better management, and, in suitable areas, to enable interplanting with cocoa later. Natives will be taught the most suitable methods of preparing copra for market, and other aspects of coconut production, by means of lectures, simple pamphlets, films, filmstrips, demonstration plots and demonstration driers.

Selected natives, employed by the Department of Agriculture as Extension Assistants, will be trained in coconut production techniques such as lining, nursery work, planting out, establishment of cover crops and in the construction and operation of copra driers.

Copra inspection staff will be trained in drying methods in order to advise planters on driers and methods of copra drying. Copra grades and the standards required in other countries particularly consumer countries will be constantly studied to keep up the quality of Papua and New Guinea copra.

"Cocoa" — A New Practical Handbook

MANY readers will learn with considerable interest that Mr. Urquhart has written this comprehensive study on cocoa—"one of the world's most favoured crops", as Sir Geoffrey Clay states in his foreword. The book is one of a series on tropical agriculture being published by Longmans, Green and Co. (London, New York, Toronto).

Mr. Urquhart is well known in the South Pacific. In the course of his engagement with the South Pacific Commission from February to August, 1952, he visited New Caledonia, the New Hebrides, Western Samoa, American Samoa, Fiji and Netherlands New Guinea. (He had already visited Papua and New Guinea and the British Solomon Islands Protectorate early in 1950 on behalf of Cadbury's.)

Mr. Urquhart spent many years in the Colonial Agricultural Service in Nigeria and in the Gold Coast, and has a wide experience of cocoa growing in tropical parts of the world. It is little wonder that such a well-qualified man could write an excellent handbook on cocoa Mr. Urquhart has had, furthermore, the valuable advice of many outstanding workers in the field. The chapters on virus diseases, rehabilitation, botany, and soils have been written respectively by Dr. Posnette, Professor Shephard, Professor Baker and Professor Hardy.

The paragraphs on nomenclature of cocoa and present-day classification may help in ending the confusion often shown in these matters in publications on cocoa.

In the chapter on "Cocoa Soils" I should like to mention especially the paragraphs on functions of shade, mulching and mulches, and root systems. Chapter V gives invaluable information on the establishment and maintenance of the cocoa plantation, followed by an excellent chapter on "Vegetative Propagation of Cocoa by Rooted Cuttings, with Notes on Some Other Methods".

In an interesting chapter Mr. Urquhart deals with the "Peasant Cocoa Culture in West Africa", where, among other subjects, the place of cocoa in a peasant economy is discussed.

One of the eight appendices is entitled "Costs of Cocoa Culture on Estates and Peasant Farms". Labour costs are given in "man-days" per acre for the Belgian Congo, comparing estimated labour requirements of plantation development from virgin bush (agricultural operations only) for oil palm, rubber, bananas and cocoa. Furthermore, labour costs are given for the West Indies (replanting old estates), and for West Africa (costs under peasant culture; cocoa with family food crops; inter-planting with food crops).

An extensive index and a wealth of illustrations enhance the value of this practical book, which is warmly recommended to all cocoa planters in the South Pacific region.

—A.H.J.K.

Commission Continues Research on Transmission of Filariasis

In 1954, Mr. Issaia B—, a New Caledonian islander suffering from filariasis, was sent to Sydney by the South Pacific Commission (see *Quarterly Bulletin*, January, 1955). The objective was to provide Drs. Backhouse and Woodhill, of Sydney University, with an opportunity for conducting research on the susceptibility of different species of mosquitoes and their hybrids to infection with the filarial parasite. The results of this preliminary research work were circulated by the Commission as Circular No. 11 in its Technical Information series.

Commission health officers (Drs. G. Loison, left, and M. O. T. Iyengar, right) capturing mosquitoes on the microfilaria carrier at Dumbea, near Noumea.

During the past twelve months mosquitoes belonging to the *Aedes pseudoscutellaris* and *Aedes polynesiensis* species and their hybrids have been raised by Drs. Backhouse and Woodhill. In view of the further research required on the ability of these species to act as intermediary hosts for the New Caledonia strain of filaria (*Wuchereria bancrofti*), they applied to the Commission for a microfilariae carrier. As a result, Mr. Emile B— agreed to spend two weeks in Sydney.

Prior to his departure, the number of microfilariae present in one drop (20 c.mm.) of his blood averaged one hundred. In a swampy area near Noumea 150 mosquitoes (*Aedes vigilax*) were collected while feeding on him. These mosquitoes were later dissected in the Commission laboratory, where it was found that nearly all of them carried numerous microfilariae. Within two weeks, these reached the stage where they could infect man.

Control of Alcoholism

As a result of a recommendation of the French Department for Overseas Territories, a committee for the control of alcoholism has been established in New Caledonia. Dr. M. Tivollier, Head of the Nouméa Sanitary Bureau, is most energetic in the Committee's activities.

Several departments of the local administration (health, public education, information, police), the army, missionary organizations and newspapers, are represented on the Committee, which holds monthly meetings.

At a recent meeting, Drs. E. Massal and G. Loison, Medical Officers of the South Pacific Commission's Health Section, were asked to advise on several aspects of alcoholism control.

Dr. Massal approached the problem as a regional one. He demonstrated that laws restricting or penalizing the consumption of alcohol provide a solution more apparent than real. Education of the public, he emphasized, could be more effective if proper measures were adopted to achieve that objective.

Dr. Loison amplified this conclusion by submitting an educational programme which might easily be implemented in the territory.

The regulations at present enforced in New Caledonia are: prohibition of certain drinks considered to be particularly harmful, import taxes, restrictions on the granting of liquor licences, prohibition of wine- and liquor-drinking by islanders (beer-drinking is authorized).

Introduction Of Edible Pond Fish From Philippines

Fingerlings of three species of edible pond fish, taken from nurseries in Manila, were flown to New Caledonia last October to stock experimental fish breeding ponds there. How the operation was carried out is described below by the Commission's Fisheries Officer . . .

H. VAN PEL

Right: During his brief stay in Manila Mr. Van Pel lectured students of the Philippine Institute of Fisheries Technology on the Commission's programme for developing fisheries in the South Pacific.

IN view of the interest being shown in territories in the stocking with fish of swamps, small lakes, ponds and streams, the Commission, in co-operation with the Port Laguerre Farm School, New Caledonia, has built two experimental fish ponds in the grounds of the school.

Each pond is 33′ x 33′ at water level, with an average depth of 2′. Wooden sluice gates with slide boards make it possible to control the water level. The bottom and dykes are of clay.

These ponds now contain three species of fish, constituting an original breeding stock which, if the planned experiments give satisfactory results, will ensure a supply of fingerlings for South Pacific territories.

The project will serve two purposes. In addition to supplying fingerlings for distribution, it will provide the trainees at the Port Laguerre Farm School, as well as those attending the S.P.C.-F.A.O. Fisheries Training Course in late 1956, with a valuable opportunity to study fish farming.

These fish have come all the way from the Philippines. On my way back to Headquarters from a fisheries survey of Guam and the Trust Territory of the Pacific Islands, I spent a few days in Manila. As the Philippines are justly famous for their fish culture industry, I was interested in securing some healthy stock for the South Pacific.

The fisheries authorities in Manila were very helpful and, thanks to their co-operation, I was able to take from their fish nurseries, 40 *Tilapia mossambica*, 32 *Osphromenus gourami* and 20 *Trichogaster pectoralis*.

These fingerlings were put in two tin containers, and accompanied me on a 5,600-mile journey by plane and car lasting eight days. No special arrangement was made for oxygenating the water or coping with the great differences in temperature encountered. However, by using some tricks such as a thermos bottle of hot water, I managed to avoid mishaps. The most courteous co-operation was extended by the authorities of the Philippines, Australia and New Caledonia. Finally, the fish came to the end of their voyage in good condition, with the exception of a few gourami.

They were immediately liberated in the two ponds at the Port Laguerre Farm School, care being taken to separate the tilapia from the other two species Twenty days later they were in good health and had already increased in size

The water is fertilized with organic manure and contains an abundant supply of food. It is therefore unnecessary to give the fish any supplementary food. It is yet too early to give a definite opinion on the success or failure of the project, since many factors remain unknown. However, the early stages have proved satisfactory.

Tilapia mossambica, Peters has great possibilities as a pondfish, both for fresh and brackish water ponds. It can also be used for stocking irrigation reservoirs and ditches and inland waters. It is a prolific breeder and a female will spawn at four months old. The species is omnivorous.

Osphromenus gourami, Lacépède (Giant Gourami) is one of the best table fishes living in fresh water. It is primarily vegetarian but will eat frogs, insects, worms, in addition to many vegetable foods. It reaches sexual maturity in its third year. A female of about 14 inches long (35 cm.) may lay from 800 to 1,000 eggs.

A three-year-old gourami weighs from two to three kilograms and will grow much heavier if it is kept longer under good conditions. It is a good fish for artificial ponds and backyard fish culture.

Trichogaster pectoralis, Pallas (Sepat Siam) matures at seven months and a female of that age will lay about 7,000 eggs. A female ten inches long (24½ cm.), weighing about 8 oz. (230 grammes), can produce 82,000 eggs. This is a good fish for lakes, swamps, rivers and irrigation canals. It is a vegetarian. Sepat Siam has become an important food fish for people who cannot afford expensive fish.

One of the two experimental fish ponds built at the Port Laguerre Farm School in New Caledonia. On the right, some of the fingerlings flown from Manila are shown being liberated.

Promising Cash Crop For Pacific Planters

For some time now the agricultural economy of the South Pacific has tended towards a diversification of crops. It has been realised that the only way to attain economic stability is through a system of mixed cultivation. It is hoped that this article, by pointing out the advantages of growing pepper in the tropical islands of this vast area, will contribute to the development of that wise policy.

By E. J. E. LEFORT*

Mature pepper plants, with foliage lifted to reveal ripening bunches of berries.

IT IS in its most primitive form that pepper cultivation could be most worth while. In fact, when cultivated as a main crop, its technical and financial requirements are beyond the possibilities of South Pacific islanders. It is, therefore considered that this new production would be best undertaken in association with other crops by Europeans and certain islanders, or in the form of home-garden cultivation as a purely native proposition. It must be realised that the more easily a new crop lends itself to cultivation methods which are closely akin to bush gathering, the better is its chance of being accepted by the natives. Under certain conditions of soil and climate that occur in our area, pepper possesses this particular advantage.

Furthermore, in a country whose economic structure is undeveloped and means of transport limited, it is advisable to keep to products which are easy to process and store. Such is the case with black pepper, which requires only simple drying in the sun and is capable of withstanding the long periods of storage which are often necessary in the South Pacific through the infrequency of inter-island shipping.

Finally, although the fancy postwar prices have dropped considerably to the rather stable price of about 6/- per pound which has now prevailed for some time, it is a valuable product which can provide a worthwhile supplement to income, if produced in addition to main crops.

At the present time pepper is grown in India, Indonesia, Malaya, Siam, Indo-China, Borneo, Madagascar and the East Coast of Africa. The last war practically brought production in Indonesia and Malaya to a standstill, but on the other hand, promoted India to the first rank of producers. At the present time India supplies 60% of world consumption, with production methods which are often very similar to those associated with bush gathering. Internal strife in Indo-China, complex cultivation methods which prove extremely costly, as well as a serious pepper-plant disease (Muller's disease) have contributed to the catastrophic fall in that country's production. This decline of the pepper plant is not limited to Indo-China but is also apparent in Indonesia, Malaya, Siam and Borneo. In India, Madagascar and on the East Coast of Africa, that is to say in areas where cultivation is casual rather than intensive, these effects have gone almost unfelt. This state of affairs is yet another point in favour of introducing pepper cultivation into our region in its most primitive form.

Another encouraging factor is that five of the six countries which control the destinies of the South Pacific are either partially or wholly dependent on foreign markets for their supplies of pepper. Their encouragement should be sufficient to promote further interest in this new crop in certain favourably situated islands of Oceania.

Botanical Description and Ecological Requirements

Pepper, *Piper nigrum* L., belongs to the family of Piperaceae. It is a vine which fastens on to supporting trees by means of clinging aerial roots which develop at the nodes. It has very green alternate leaves, opposite which appear the inflorescences in the form of single or multiple spikes. The flowers are sometimes unisexual, that is to say, either male or female. The fruit are slightly pulpy berries which, in groups of 20 to 50, form hanging clusters 3 to 4 inches long.

The pepper-plant grows in hot, damp countries and flourishes best in low-lying areas with a high rainfall. However, it is commonly found growing at altitudes up to 1,800 feet and is sometimes found even at heights of from 3,000 feet to

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3,600 feet. It is adverse to strong winds, over-exposure to the sun and prolonged drought.

It requires a minimum yearly average temperature of 75° to 76° F. and a total rainfall of at least 60 to 80 inches during the fruiting season. It should be added that annual rainfall can be as high as 200 inches or more without affecting the growth of the pepper plant. On the other hand, it is capable of withstanding a dry season of from two to three months, provided the roots are anchored in a cool, healthy soil.

Good natural drainage is a far more important requirement than a high mineral content. All soils which, for one reason or another, have poor drying qualities should be avoided, and particularly land of a "resistant" nature which holds excess water on the surface for long periods. These drainage requirements of the soil are extremely important, and the general condition of plantations is largely dependent on the attention given to them. This explains the pepper plant's preference for sloping land and for heavy overall rainfall rather than occasional torrential downpours.

In common with coffee, cacao and vanilla plants, *Piper nigrum* thrives on surface humus. Mulching is therefore recommended. Thinnings from the associated crop or shade-tree are used for this purpose as well as the vegetation obtained by cutting down the natural covering or, better still, cover-plants of the non-climbing variety, such as *Indigofera endecaphylla* which covers adequately without becoming a nuisance. Mulching has the threefold advantage of fertilizing the soil, keeping it cool and preventing erosion.

As for the pH content, the pepper plant is by no means difficult since it happily accepts acid soils with a pH content as low as 5.5, as well as alkaline soils with a pH content as high as 8.5.

Methods of Cultivation

No mention will be made here of intensive production along Chinese lines, which comes into the category of horticulture rather than agriculture and necessitates capital, labour and techniques which are less suitable to Pacific Islands conditions.

One aspect alone deserves attention: the plantation should show a profit, whatever the price for pepper. Admittedly, in good periods intensive commercial cultivation gives profits far in excess of the margin of cost, but should prices fall, high production costs may make it impossible to continue maintenance of the plants which, left without care or shade (or almost so), deteriorate and die. Grown under home-garden conditions or in association with another crop—methods of cultivation which avoid or reduce labour problems—the plants will survive even if they receive no regular attention, since shading continues. Certainly, when grown as a casual crop pepper produces much smaller yields, but the economic risks are considerably less than when grown as a main crop. What is more, the former method is perfectly adapted to the simple agricultural practices of the Pacific Islander.

Pepper might be cultivated in the South Pacific in association with coffee and cacao. In this case, it would be no more than a secondary crop, with no major requirements, and merely intended as a supplement to the main sources of income. For supports one could use either the trees left when the land is cleared or those which are planted for the specific purpose of providing shade for the coffee or cacao plants. The density of the pepper plants would thus be equal to the density per acre of shade plants.

Apart from a little special care, which will be considered later, the pepper plants would receive exactly the same attention as that given to the main crop. Since such attention, at least in the case with which we are concerned, corresponds to the common requirements of both crops, neither would suffer from the proposed association.

Home cultivation in family gardens, calling for only occasional care during leisure hours, should be certain of showing a profit. Any of the trees which usually grow in the gardens are capable of providing adequate support, provided they have a straight trunk. Village waste is generally sufficient for enriching the garden soil. Should the garden have a flat surface, it is absolutely necessary to build an earth mound about 20 inches high at the foot of each tree selected as a support. By this method, the pepper plants are able to grow without danger of excessive humidity.

Along the same lines of casual cultivation akin to bush gathering, certain strips of secondary forest lying on slopes might be roughly cleared and planted with *Piper nigrum*. It would be possible in this case, as for the other cultivation methods described above, to vary the degree of care given to the pepper plants according to the price at which pepper is selling.

Planting of Cuttings

Vegetative propagation of the pepper plant is by far the most worth while, and also the most usual, method. After arranging such further introductions into the South Pacific as might be necessary if the cultivation of pepper is to be developed here, planting would have to be done with rooted cuttings. The best way to obtain these is to place each cutting in a small palm-leaf container previously filled with rich porous earth. These small containers have the advantage of being easily looked after and can be planted directly beside the support as soon as the plant has taken root. This method, which should be only carried out by the territorial Agricultural Departments as the distribution centres, would gradually be abandoned as propagation material became sufficient.

At this stage, propagation would become far more simple. As an economy measure, cuttings would be taken, not from main stems of young creepers previously cut back for this purpose, but from the secondary shoots at the base which can grow to a length of from 7 to 10 feet. By this method, one plant can supply 20 or so cuttings averaging around 20 inches in length. This planting material would be placed directly in the soil in groups of 4 or 5, or even more, cuttings, depending on the size of the support. Since, in this case, there is a chance of one or more of the cuttings not taking, replacements should be available.

The best type of cutting has five or six short internodes. Cuttings are generally planted with two-thirds of their length underground and the other third resting on the support. They are always placed in such a way as to avoid over-exposure to the sun. Shade is provided at the beginning by attaching a few branches to the living support and arranging them leaf downwards just above the cuttings.

Plant material must be taken from hermaphrodite plants, that is to say those having bi-sexual flowers. Indeed, female plants are never sufficiently pollinated to give full bunches, whereas the male plant does not produce fruit at all. Cuttings should not be taken, therefore, until the plant has started producing, that is to say after a minimum period of from 5 to 7 years, unless the bi-sexual character of the young plant is absolutely certain. As can be seen, development of pepper cultivation in the South Pacific would have to be preceded by a large-scale introduction of cuttings and propagation work over a considerable period.

We should add, however, that quite recently a new method of asexual propagation from cuttings with one eye has been developed. Utilized on a large scale, this could result in a very considerable reduction of the propagation stage just described.

As far as possible, it would be better to introduce material from areas free from Muller's disease (*Phytophthora palmivora* Butler variety *Piperis Muller*) or else to introduce material with a resistance to the disease, such as the "Belantoeng" variety which originally came from Sumatra. In fact, the only way to avoid this disease entering the South Pacific region would be to ensure that all introduced pepper cuttings pass through an introduction station in the area where the necessary plant quarantine facilities exist and a close check can be kept on the cuttings until their freedom from disease has been established—

e.g., Naduruloulou in Fiji and Laloki in Papua.

It has been noted in India that the place of origin of the cuttings has a great influence on their subsequent development. Those coming from a dry area have been noted to develop perfectly well in a damp climate, whereas in the contrary case, there was no certainty of their taking and their growth would be retarded. Similar observations have been made in Indo-China. There is admittedly no scientific evidence for this statement but it should be taken into account so as not to overlook any possible chance of ensuring success from the outset.

Maintenance Work

Pepper plants produced from cuttings taken from the lateral basal shoots do not produce side-shoots until they have reached a height of from 3 feet to 4 feet 6 inches, which is an advantage for plantations along the lines proposed, as these are rarely very orderly. With this method of cultivation only a minimum of care needs to be devoted to attaching the creepers to the supports, although the development of the clinging roots at each node, and consequently the production of new fruiting stems depends on the number of attachments.

Under such conditions pruning is out of the question, but the thread-like stems found growing along the creeper should be removed and the crown occasionally cut back to encourage lateral shoots.

Provided no damage is caused to the main crop, the supporting plants can be thinned out so as to reduce the shade during the flowering period. Extra light encourages flowering.

As for soil maintenance, let us repeat that the pepper plant takes what benefit it can from the care given to the main crop. The same applies to fertilizers as well as to measures taken for the control of insect pests and diseases.

When grown in the family garden, the plants can be weeded and a kind of mulching practised by piling up garden rubbish at their base. Repeated several times over, this practice finishes by producing a mound which is particularly suitable for the pepper plant. On flat ground this is a necessary preliminary to planting.

I would mention once more that planting will prove the more satisfactory when established on well-drained land; the best pepper soils generally being those lying on slopes.

Harvesting

The pepper ripens, depending on varieties and regions, from six to eight months after flowering.

The bunches are ready for picking when the fruit is beginning to turn red. At this stage, the berries are not ripe enough to fall from the creeper or to be eaten by birds, which are particularly fond of them. When black pepper is required, all the berries are harvested at once at the stage when most of them appear to be ripe. By this method, a mixture of green, yellow and red fruit is admittedly obtained, but this has only relative importance where black pepper is concerned, since the ripeness of the berry is of little consequence.

Harvesting is done with the help of rustic ladders or preferably steps, which have the advantage of leaving the hands free. All the fruit is picked, even bunches attacked by insects or affected by fungus. A general gathering-up of fruit which has fallen onto the ground completes the harvesting.

When cultivated in the manner suggested, the pepper plant does not really start producing until the fifth to seventh year. Yields can vary considerably. Depending on the height of the creeper, its condition and the care given to it, anything from several ounces up to scores of pounds of dry pepper can be produced by one plant. Under such conditions as have been described here, an average of one pound per plant can be expected.

Processing of Black Pepper

This is quite simple and therefore well suited to the capacities of the islanders.

The pepper is dried in the grain or bunch. In the latter case, the grains are easily removed by treading underfoot after drying. However, the first method is generally used because it enables preservation of hollow grains which constitute a secondary quality and which would be destroyed by the treading method.

The drying is done in the sun on mats or on an area of rammed earth. To avoid soiling of any kind, it is preferable to carry out this stage on a cement area or on trays, as in the case of coffee. During the drying period, which takes from three to four days, the berries are stirred several times. The operation is complete when the skin of the berries is black and wrinkled and the grain hard to the teeth. At this stage the pepper should not contain more than 10% moisture.

After drying the pepper is sifted, or preferably winnowed, to remove light waste matter and to separate the hollow grains. Sorting by hand is necessary to remove stones. Grain produced on rammed earth is almost always washed to give it a more marketable appearance. It subsequently undergoes a second rapid drying away from dirt.

A superior method of processing black pepper consists of plunging the freshly-picked berries into boiling water for a few seconds, and then drying them in the sun. This method makes it possible, firstly, to float out the light waste matter and, secondly, because of scalding, to facilitate subsequent drying. The pepper obtained has at the same time greater density and a more uniform colour, which give it a higher commercial value.

The proportion of green pepper to dried pepper is a varietal character of great importance. It is one of the major factors conditioning the income of pepper plantations. It is generally calculated that a good variety will produce 37 pounds of black pepper after drying, for every 100 pounds of freshly-picked green pepper.

It is obvious that the outlook adopted in this article with regard to pepper cultivation is not in line with classical techniques. We have been guided, however, by the old saying which claims that "the economy is made for the man and not the man for the economy". In the South Pacific, historical, demographic and human factors often have an inhibiting effect on the most justified reforms of a systematic type. Professional dogmatism has, therefore, been left aside and attention centred on making use of the old systems of agriculture still in existence, which, in the case of pepper at any rate, are more likely than any other method to result in a favourable reaction on the part of the islanders.

Furthermore, the present-day prospects on the pepper market as already mentioned, as well as the example of India, which has managed, even by using only simple measures, to make good in large part the immediate post-war decline in world production, encourage an objective attitude to the question and fully support the launching of pepper cultivation on a large scale in the favourably-suited islands of the South Pacific.

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Mechanization Of Coconut Growing

In this article the author examines methods of mechanizing coconut growing, which he considers is an important and difficult problem. Important, because mechanization can substantially lower production costs; difficult, because it requires an outlay of capital that planters can rarely afford.

By E. J. E. LEFORT*

This sketch illustrates a suggestion made by the author to mechanize harvesting of nuts. It comprises a rigid tower with platform from which an operator manipulates a cutting pole and light, flexible harvesting chute.

COPRA processing, which has been covered at some length in the recent report by Mr. W. V. D. Pieris on the *Manufacture of Copra in the Pacific Islands*[1], will not be considered here.

A coconut plantation cannot be perfectly mechanized unless it has been perfectly established. Proper establishment is always dependent on proper land clearance, and this cannot be done economically without the assistance of mechanical equipment. For this reason it is logical to begin by considering the different mechanical aids to land clearance.

Land Clearing

The undergrowth is cleared away with brush-cutters of various types, the work being started and completed, especially in creeper forests, with a mechanical saw, which can be adjusted to cut at any angle or height required.

Felling is done with petrol, electric or pneumatic saws. The small trees are felled first, then the tallest.

Tree felling and the removal of stumps are somewhat delicate operations which can be carried out by clearing each tree in turn with a bull-dozer or tree-dozer, or by the land-clearer. For this a heavy, armoured tractor is required (minimum 140 h.p.). It is sometimes done with winches.

Removal of stumps, by reason of its high cost and the large cavities produced, should be reduced as far as possible. Often it is practicable simply to level off the stumps. The largest are generally left, even on pathways.

Lopping and cutting off are done with light cutters. One of the most practical to handle, although fairly dangerous, seems to be the chain saw, which can work at a distance of 160 yards from the compressor unit. Four or five saws can be run independently off the same unit. The clearing of pathways between the rows and their approaches is done with a heavy tractor fitted with a 9-prong land-clearer. This attachment collects and stacks the logs. By clearing so thoroughly it is possible subsequently to mechanize maintenance and gathering.

The pathways are made with the use of a root-rake or root-cutter, followed by a levelling blade and ancillary equipment.

Roads are built with a heavy tractor plus a land-clearer, bull-dozer, winch, grader and other equipment.

Planting

Coconut nurseries are established by the same methods as those described above. However, all stumps are removed and all timber hauled out to the boundaries. Then a Canadian cultivator, a plough, and levelling blade are in turn passed once back and forth over the land.

Marking and pegging out of tracks is done with the help of an optical square.

Holes are made with a hole-digger drawn by a light tractor. Mechanical drills are also capable of making holes of 2′ diameter and 3′ depth. Special drills can be used on heavy soils for loosening the earth around the holes.

Maintenance

All ploughing and digging operations can be carried out mechanically, particularly the digging in of green manure, including the natural grassy cover as well as other organic matter. Ploughs with independent discs now exist for this purpose and make very light work of all obstacles (stumps, rocks, etc.), giving excellent results.

For cutting down the natural woody vegetation there exists a drawn brush-cutter with a swivel cutting disc which works swiftly and safely. A further advantage is that the disc can be replaced by a circular saw blade capable of felling trees of from 12″ to 20″ diameter. Another brush-cutter of the mastodon type not only clears everything before it but also breaks up trees and brushes into fragments, thus covering the soil with a layer of excellent organic matter. These two pieces of equipment would be particularly useful for restoring plantations.

Similarly, saws mounted on a pivot are useful for cleaning crowns and removing epiphytic vegetation attaching to the trunk.

Mineral fertilizers can be applied automatically by means of a drawn or mounted spreader. The same method can be used for treating the soil with insecticides such as HCH (*Oryctes* control). Pressure sprayers are used for applying various products from a distance. Furthermore, the same sprayer fitted on collapsible poles may be used for treating coconut palms against various insect pests and fungi.

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[1] S.P.C. Technical Paper No. 82, June, 1955.

The establishment of contour levels, drainage and irrigation works might all be improved by mechanization.

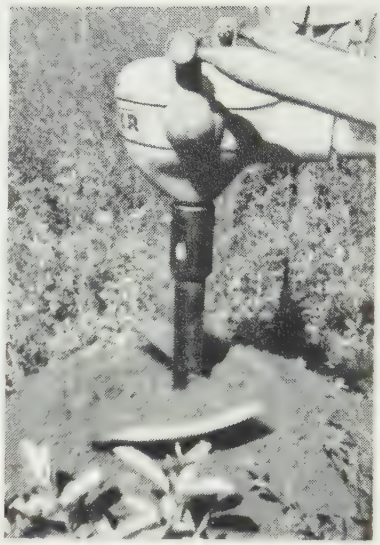
Harvesting

This is done by allowing the nuts to fall naturally or causing them to fall artificially. Mechanization of harvesting should automatically include picking, to reduce labour requirements in the case of artificial falling of nuts or to minimise copra losses when the nuts are allowed to fall naturally.

While the latter method is simple, and perfectly suited to the contemplative temperament of our islanders, its use can decrease the total yield of copra by about 15% to 20% because the fallen nuts are either overlooked, or sprout while on the ground. Taken as a whole, the mechanization of harvesting in the islands would result in a substantial increase in copra yields.

To achieve this aim, the processes of knocking down the nuts, gathering them together, placing them in heaps, and loading into the transport would need to be combined into a single operation. Since no equipment exists at present capable of performing this set of activities simultaneously, the following suggestions are offered.

The pole could be mechanized and used for cutting down the bunches. It could be worked off the motor of the transporting tractor. It would be attached at the base of a light, rigid, adjustable and telescopic chute, which would be placed under the bunch to be harvested and direct the nuts into a trailer drawn by the tractor. This cutting pole might take the form of equipment of the *coupe girafe* or *moto machette* type which comprises a circular saw fitted to the end of a telescopic, adjustable shaft. The system would in fact be little more than the adaptation to coconut harvesting of the automobile saw commonly used for timber extraction, known as the "Little Giant".



A hole-digger attached to a tractor at the Port Laguerre Farm School, New Caledonia, where it is used for fencing, planting trees, etc.

Right: A close-up of the hole-digger in action.

Obviously the receiving chute could be replaced by a tractor-drawn harvesting mast, operated mechanically, pneumatically or hydraulically. In this case it would be necessary to fit a blade to the top of the mast, whereas in the other case only a driver blade would be necessary. Should a mast be chosen, cutting might be done by hand and the bunches shot into the trailer.

There is at present in France a portable collapsible mast which can be elevated to a height of 75 feet. It is worked by an electric motor (1½ h.p.) or by hand. Depending on circumstances, it can be erected at a rate of from 8 feet to 30 feet per minute. When packed, the mast has the appearance of a chain wound around a drum. It is extended upwards by an ingenious system of interlocking links.

An alternative method would be the operation of a battery of four or five chain saws adjustable by hand to cut bunches of nuts. These could be run off one compressor unit up to a distance of 500 feet from it. The nuts could be collected together in the alleys between the rows with a mechanical rake fitted with a raising device.

It seems possible at present to gather nuts from the ground in a pick-up drawn by a jeep. This equipment comprises a rudimentary collecting device for lining up the nuts on the ground in front of a spike chain hoist which picks them up and throws them into a trailer drawn by the pick-up. This system does not yet appear to have been proved in practice.

Since these suggestions are all entirely hypothetical, it is perhaps not entirely out of place to suggest that gathering might also be done with a high-powered suction unit.

When the nuts are gathered into sizeable heaps, they can be loaded by mechanical shovel on to tip-trailers drawn by light tractors.

Obviously, provided all these improvements could be found workable and put into practice, they would prove more successful on fairly level plantations with tracks for harvesting and transport to driers.

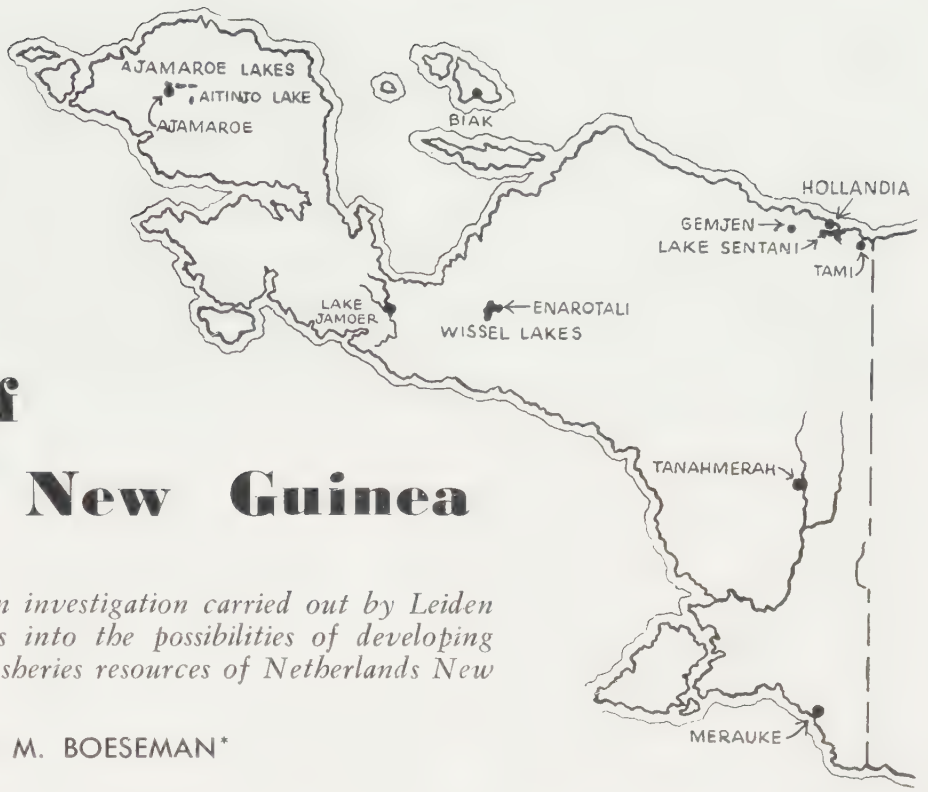
The possibilities of using mechanical aids to coconut growing and harvesting have not been widely investigated, and it has therefore been necessary in this article to suggest the application of methods which have not yet been proved by experiment.

Conclusion

Mechanization of coconut growing is an important problem and one that is

(*Continued on Page 29*)

A brush-cutter clearing guava at the Port Laguerre Farm School, New Caledonia.



Map showing principal localities visited during the investigations.

The Lake Resources Of Netherlands New Guinea

An account of an investigation carried out by Leiden Museum scientists into the possibilities of developing the fresh-water fisheries resources of Netherlands New Guinea.

By M. BOESEMAN*

WHEN the development of fresh water fisheries in Netherlands New Guinea was being considered recently, it soon became evident that the scarcity of faunistical data hitherto published for the region could not provide a satisfactory starting point for specialized fishery-biological investigations. The few scientific papers on the subject cover only a very small part of the immense area; they are also rather incomplete, even for the best-known parts.

Consequently, it was thought advisable to start investigations of the fish fauna by collecting sufficient material from the principal waters (generally lakes) to enable compilation of an inventory of the various species, and more or less to establish their geographical distribution. This would provide the data necessary for future investigations by a fishery expert.

To execute this initial programme, the author was invited to visit Netherlands New Guinea. As this visit coincided with that of the sub-Director of the Leiden Museum, Dr. L. D. Brongersma, herpetologist, and Dr. L. B. Holthuis, carcinologist, our efforts could be pooled, yielding considerably improved results in our various fields. The facilities provided by the Government and the Royal Netherlands Navy, hereby gratefully acknowledged, proved essential to the success of our investigations.

In the course of seven months, localities all over the Dutch territory were visited, the principal being (in chronological order): Lake Sentani, the Tami River (south-east of Hollandia), Biak, Lake Jamoer, the Wissel Lakes (Paniai, Tage, Tigi), the three Ajamaroe Lakes, Aitinjo Lake (south-east of Ajamaroe), the surroundings of Merauke, and the Digoel River near Tanah Merah.

Lake Sentani

This lake is situated a short distance south-west of Hollandia. Its waters are among the best investigated in the territory. Its shape is very irregular. Narrow at some places, it has a maximum diameter of approximately 26 k.m. Altitude is about 75 metres; depth at least 50 metres. The water is rather clear, but there is said to occur an intense seasonal (?) increase of algae. Aquatic vegetation is generally scarce, and an attempt to collect planckton (end March, 1955) virtually failed. Even very long hauls showed minimum results. There seems to be an open effluence via the Tami River to the Pacific coast, slightly east of Humboldt Bay.

The rather numerous species of fish have but little economic importance, only the smaller species being in any abundance. Larger specimens of the Gobiiformi "gaboes" (e.g., *Ophiocara* sp.) are captured and eaten by the native population, but other edible fishes are rather scarce.

Fishing is generally the task of the women, working singly or in groups. They are excellent swimmers and expert divers. The less fatiguing collection of fish from artificial hiding-places, erroneously called "séro's", is mostly done by the male population.

The "séros", which are found almost everywhere along the shores, especially in the numerous bays, are family property. They consist of a number of large stakes firmly planted in the mud in a circle with a diameter of about three metres. Within this frame, the space is filled with branches, leaves, rubbish, and dirt, forming an ideal hiding-place for all kinds of fish.

Twice a year the male members of the family owning the "séro" collect the fish with primitive dip-nets. They first put a kind of mat around the "séro", and then take the rubbish and branches out, throwing them into a new circle of stakes erected next to the old "séro". In this way they build up their new "séro" while demolishing the old.

We had the privilege to be present at such an event, and saw the natives collect some large eels, numerous "gaboes" of various sizes, and quite a number of small specimens. However, the total result seemed rather disappointing.

As well as numerous "gaboes", probably belonging to more than one species, we collected beautiful, often orange and bluish Melanotaeniidae, small gold-glimmering perch, catfish, mullet, jacks(!), eels, etc.

The occurrence of formidable saw-fish was remarkable. Two, measuring 286 and 332 cm., were captured, preserved in

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Left: Shore of Lake Sentani, near Joka. Native prau in foreground. Right: View of Lake Sentani, with so-called "sero" vaguely visible, right centre.

formalin, and shipped to the Netherlands, a feat well noticed by press and news services.

From local sources we were informed of the occasional (probably seasonal) occurrence of mass mortality of fish, coinciding with the temporary increase of algae, spreading across the lake from west to east. This seems to be of the utmost importance in connection with future fishery possibilities, but it still needs confirmation.

A small bay near Borowai (s.w. Lake Sentani), connected with the open main lake by only a very narrow outlet, and said to possess the same physical characteristics, may at little cost be transformed into a reservoir fit for future use in fishery experiments (e.g., transplantation).

Tami River

Only a short visit was paid to the Tami River, but unforeseen circumstances (the extremely high level and speed of the water) did not permit any thorough research. In a dead arm of the river we collected with rotenon a considerable number of Melanotaeniidae, small goldfish perch with beautiful purplish brown stripes, and numerous "gaboes". The Tami River itself yielded a large catfish.

Biak

During most of the time, Biak was the base from which we planned and started our various trips to the mainland Here only a few examples were collected in the brackish waters of the south-eastern part, but real fresh water species (e.g., "gaboes") probably occur in the few small streams far inland.

A considerable part of this island consists of coral rock, the small rivers flowing beneath the surface towards the sea. The rather intense native fishery seems to be entirely marine.

Lake Jamoer

This lake, situated far inland on the narrow "neck" of western New Guinea, is almost circular with a diameter of approximately 7½ k.m. It is connected with the Arafura Sea by the Omba River. No accurate data are available, but the altitude may be about 60 metres, the depth probably 12-15 metres. The water is rather clear, the aquatic vegetation moderate to scarce, except at some localities along the shore, which is mostly swampy. The local population is small, and fishing must be very moderate. This hitherto almost unexplored lake yielded some of the most interesting results of our present investigations.

The most spectacular fish collected here was, beyond doubt, a kind of shark probably confined to fresh water. With the help of the local population we were able to collect three whole specimens, of sizes varying between 75 and 150 cm., and the jaws of a fourth.

Although there is an open effuence to the sea via the Omba River, difficult physical circumstances said to exist in this river make it unlikely that these sharks are occasional visitors only. Moreover, though some sharks (*Eulamia, Carcharias*) freely enter estuaries and rivers, no such reports are available from the present region.

The Jamoer sharks do not seem dangerous to man. The local population took no precautions while swimming or bathing at the precise points where sharks had been observed.

Among other fish collected during our short stay the most interesting were garfish, very large perch, catfish, eels, and some archer fish of considerable size. Saw-fish are said to occur in the deeper parts of the lake, but could not be obtained on account of the high level of the water. (Afterwards we were able to obtain a nice saw from this locality.)

The density of the fish population seems considerable, and an important part attains a large size. Most interesting is the completely marine aspect of most of the species, a phenomenon also observed in the Upper Digoel River and, less strikingly, in the Sentani Lake.

The Lake also harbours fresh water turtles (*Carettochelys insculpta* Ramsay), crocodiles (*Crocodylus novaeguineae* Schmidt), and a species of water snake (*Acrochordus granulatus* Schneider). In the marshes along the shores of the lake, turtles belonging to a species of the genus *Emydura* are abundant. Both turtles and crocodiles serve as food to the native population.

Some small streamlets emptying into Lake Jamoer yielded several examples of Melanotaeniidae, "gaboes", catfish, and crayfish.

Wissel Lakes

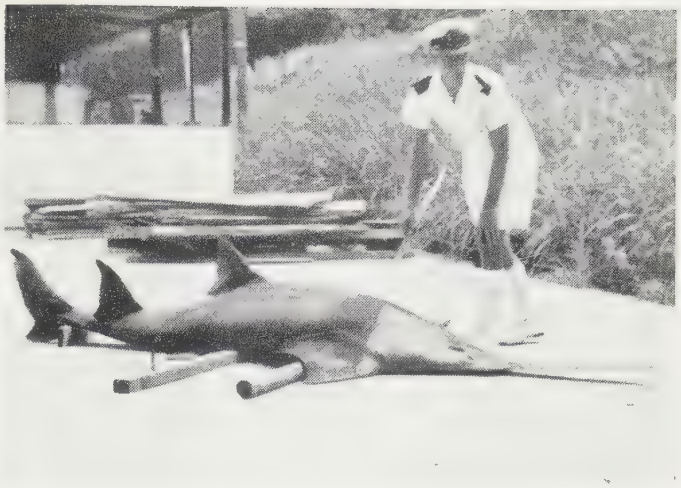
In the three Wissel Lakes, Paniai, Tage, and Tigi, of maximum diameters of approximately 16 k.m., 8½ k.m., and 7½ k.m., only a single small Gobiid species could be collected. This species, *Oxyeleotris fimbriatus*, principally inhabits the effluent rivers, seldom straying into the open lakes. It is not eaten by the local population, but is used as bait in the very intense native crayfish fisheries. Rumours concerning a second species remained unconfirmed, and can be neglected.

The general impression we gradually acquired during our investigations is that there seems to be a definite connection between the quantitative occurrence of fishes and crayfish or large shrimps, one of these groups generally more or less excluding the other. Seldom are both groups co-existent in sufficient quantities to be of some economic importance. Because of this it seems extremely risky to import fish into the Wissel Lakes, the crayfish at present being by far the most important source of proteins for the native population.

Ajamaroe Lakes

These three lakes have a maximum diameter of about 6½ k.m., 2½ k.m., and 5 k.m., and are connected by a river which flows eastward through the lakes, further on turning to the south coast.

The water is very clear and shallow, the depth seldom exceeding two metres. The bottom is extremely muddy, and the aquatic vegetation often remarkably dense. Nevertheless, the amount of planckton collected at the time of our visit (March, 1955) was very poor.



Left: Shark taken from Lake Jamoer, possibly a new fresh-water species. Total length 1.52 metres. Right: Saw-fish taken from Lake Sentani. Total length 3.32 metres.

Numerous well-constructed fish traps are placed by the native population in the tributary and effluent rivers, generally in a series across the river, with the interspaces filled up with stakes, branches, and weeds. Fish spears are also used.

The fish fauna is very poor, and, though some species ("gaboes" and Melanotaeniidae) occur in considerable numbers, is of limited economical importance. We collected species of "gaboes", Melanotaeniidae, catfish, and the imported Labyrinthid *Trichogaster pectoralis*, a small gourami-like fish of some value as food for the native population. Rumours concerning a larger Labyrinthid species remained unconfirmed.

Lake Aitinjo

This lake consists of two oddly-shaped parts connected by a short, fast-flowing stream, with numerous small cataracts breaking through a narrow cleft. The southern part especially shows a completely different aspect in comparison with the Ajamaroe Lakes. The latter are shallow and surrounded by marshy shores, while Lake Aitinjo has a highly variable depth (to 15-20 metres according to local information) and is surrounded mostly by steep, high, rocky shores, especially along the southern part.

Though marshy at some places, the bottom is generally rocky, with sand, gravel, and boulders. The density of aquatic vegetation is highly variable. Locally it is very dense. The effluence is said to be subterranean, probably over a considerable distance. The speed of the clear water gradually diminishes southwards, the water being almost stagnant near the presumed outlet in the southernmost part. The amount of planckton was extremely small (March, 1955).

The same kind of fish traps as are used in the Jamaroe Lakes are placed in series in primitive screens, but here the screens are built zigzag, with the traps at the downstream angles.

The fish fauna is even slightly poorer than in the Ajamaroe Lakes. We collected only a single species of "gaboes", a Melanotaeniid, and a species of catfish. According to local information, there occurs a large species of eel, but as these are captured only during periods of extremely low water, no specimens could be obtained.

Merauke

Some collecting took place in puddles and ditches in the surroundings of Merauke. The water was stagnant, moderately clear, and is presumed to be slightly brackish. The aquatic vegetation was considerable. The species collected included mullet and a kind of sole, all collected with dip- and cast-nets.

Fishing here is mostly done along the wide sandy seashore and in the salty or brackish lower reaches of the Merauke River.

Digoel River (near Tanah Merah)

The strongly meandering Digoel River, flowing fairly rapidly through the flat marshy plains of southern New Guinea, often changes its course and is consequently accompanied by numerous old meanders more or less completely cut off from the main stream, and filled with almost stagnant water. According to local information, this is the habitat of a species of fish named "kloso" ("o" as in "more"), known from this region only from an old photograph (1909), and identified as *Scleropages leichardti* Gunther. Because of the circumstances, however, this identification should not be regarded as definite: the *Scleropages* from the Digoel River may represent an entirely new species.

Principally to try to collect specimens of this very interesting species, which belongs to a scientifically most important family (Osteoglossidae), this region was visited, but again the high level of the Digoel caused further failure. However, it is expected that specimens will be collected and sent to the Leiden Museum soon.

Except for this failure, our visit proved a great success. In the river and in one of the abandoned meanders we collected about twenty different species of fish, often of considerable size, and almost all of a definitely marine aspect. This was further stressed by the capture of some specimens of normally marine sea snakes, a very strange thing to happen about 700 or 800 k.m. from the sea.

In the dead arm of the river we collected several specimens of large garfish, large herring-like fish, anchovies, Melanotaeniidae, and "gaboes". The Digoel River itself yielded also some large catfish, anchovies, herring-like fish, several species of catfish, large perch, mullet, croakers, specimens of *Kurtus*, archer fish, and some smaller species. We also obtained some small saw-fish, and three cut-off saws.

The turtle *Carettochelys insculpta* Ramsay is of common occurrence in the Digoel River. In the marshes of dead river arm and in the smaller streams emptying into the Digoel, turtles belonging to the genus *Emydura* are found.

The above account gives only a superficial impression of the very important results obtained. As containers with alcohol were left at several localities, still more acquisitions may be expected soon. With this material in hand, it may be possible to compose a reasonably complete list of the fishes of Netherlands New Guinea.

As further scientific research is necessary to identify the various species, some of which may be new to science, and as a considerable part of the collections has not yet arrived at the Leiden Museum, the present author generally has had to abstain from giving definite Latin names.

Dr. L. D. Brongersma has kindly provided the herpetological data.

Xanthosoma Brasiliense: A Useful Green Vegetable

The leaves of some taro varieties are the most common green vegetable used by the Pacific islanders. In addition to the leaves of the indigenous taro (*Colocasia*), leaves of the introduced American taro (*Xanthosoma*) are thus also used by the natives. These *Xanthosoma* taros are known in the islands under the name of "tarua", "dalo ni tana", "taro kong kong", "talo papalagi", "taro de Tiwaka", "taro de Fidji", "taro des Nouvelles-Hébrides", etc.

In Tahiti, another species of *Xanthosoma, X. brasiliense* (Desf.) Engl., was introduced many years ago. It is a herb of rather small size by comparison with the *Xanthosoma* commonly grown in the South Pacific islands for their tubers and young leaves. The leaves and stalks of *X. brasiliense* are the main edible parts of this plant. The tuber is not commonly eaten.

This green is known in Tahiti under the créole name of "Calalou", which in the French West Indies is a sort of thick soup made with *X. brasiliense* leaves, cucumber, gumbo, chillies, tomatoes, other greens, spices, bacon, etc.

From Tahiti, *Xanthosoma brasiliense* was introduced into Hawaii around 1930 by the botanist G. Wilder. To-day it is known there under the name of "Tahitian spinach".

Yield, quality and palatability of this useful green are such that its introduction into other Pacific islands is worth while. Cuttings have been sent to the Naduruloulou introduction garden to be multiplied for that purpose.—J. BARRAU.

Xanthosoma Brasiliense, known in Hawaii as "Tahitian spinach", is a high-yielding, palatable green vegetable worthy of introduction into other Pacific islands.

Copra Expert To Visit Pacific

The International Association of Seed Crushers has advised the Commission that, in collaboration with Unilever Limited, London, it is sponsoring the visit of a technical representative, Mr. H. D. Howard, who is experienced in copra handling and processing, to centres of copra production in the Pacific area. He will be leaving London in January, 1956, travelling via Ceylon, Singapore, Djakarta, Manila, the South Pacific Islands, Sydney, Honolulu, San Francisco and New York.

During his tour, which will last about four months, he will study copra production methods and many other aspects of this industry which is so important to the South Pacific region. Mr. Howard hopes to discuss with interested persons in the territories problems which need to be tackled in order to improve the standard of quality of copra exported from the producing centres.

Insect Pathologist Joins Commission

Dr. Paul Surany, an insect pathologist formerly with the Illinois Natural History Survey in Urbana, Illinois, U.S.A., joined the South Pacific Commission in October, 1955, to conduct a survey of the diseases of the coconut rhinoceros beetle (*Oryctes rhinoceros*), in the South-East Asia and East Africa areas.

This project, financed by a grant to the South Pacific Commission by the Rockefeller Foundation, is part of the Commission's programme to find a means of control of the rhinoceros beetle in the Pacific Islands. Dr. Surany has visited research institutions in the United States, Canada and Hawaii to discuss technical aspects of his work with the leading men in this new field of insect control. Following these visits he proceeded to Fiji and Western Samoa, where informal discussions took place with entomologists actively working on the problem of controlling the rhinoceros beetle.

Dr. Surany arrived in Noumea in late December to complete arrangements for his field work in South-East Asia, which will commence in February.

Leprosy in the Loyalty Islands

In June, 1955, the South Pacific Commission published a report by Dr. Lacour, Director of the Pasteur Institute in Noumea, entitled *An attempt to control leprosy by B.C.G. vaccine in the Loyalty Islands.*

The research undertaken by the Health Department of New Caledonia and Dependencies on this subject with the technical and financial assistance of the Commission will extend over several years.

The first report concerns the scientific and practical interest of the research, describing the geographical conditions in the Loyalty Islands, the way of life of its inhabitants and population trends. It contains a brief history of leprosy in this group, its endemic evolution and a detailed description of the present situation.

The work carried out in the course of 1954 is given in particular detail: description of tactics for operational work, and techniques used (tuberculin test, lepromin test, vaccination and investigation into the durability of dry B.C.G.).

The results are presented in table and graph form, indicating the following for each of the various districts and according to age-group:

(a) Tuberculin and lepromin indices,

(b) the different combinations of the results of these tests,

(c) the percentage of vaccinated persons,

(d) the intensity reactions to lepromin and tuberculin, and

(e) the nature of reaction to the lepromin test on contagious and non-contagious lepers.

The author concludes by stating that it is not at present possible to formulate any opinion on the value of B.C.G. vaccination in the prevention of leprosy. Only a long period of observation will provide a precise criterion for this evaluation.

The mimeographed report, comprising 15 pages of text, 4 sketches, 16 graphs and 9 tables, has been published in both English and French. It may be obtained on request from the Secretary-General of the Commission.

Technical Papers on Education

Technical Papers Nos. 72 and 73 are concerned with educational topics. No. 72, *Literacy Teaching for Adults,* has been prepared by Dr. K. Neijs, the Commission's Adviser on Literacy, from material initially collected by Mr. Howard Hayden, then Director of Education in Fiji. The paper surveys the documentary material available on the most effective methods of teaching illiterate people to read and write.

Mr. J. C. Nield's *Educational Evaluation—A Documentary Survey* has appeared as Technical Paper No. 73. Mr. Nield, who is a well-known Australian educationist, has prepared a fully annotated review of available information on methods of educational evaluation in circumstances similar to those of Pacific island territories. It is hoped the review will prove of help to those planning future research in this field and also assist territories by providing an up-to-date reference document on the subject.

Captain Cook's chart of Palmerston Atoll, which he discovered on his second voyage in 1774, and named after the then First Lord of the Admiralty. The chart was published in London in 1777. Palmerston Atoll is the most southerly of the Northern Cook Islands, 270 miles north-west of Rarotonga. It is subject to severe hurricanes, so severe, in fact, that two of the eight islets charted by Cook have since vanished into the sea.

Hurricane's Wake

How inhabitants of an atoll contrive to exist after its complete devastation by a hurricane is revealed in this account by a correspondent. The locale of his story is Palmerston Atoll, in the Northern Cook Group.

By RONALD POWELL*

THE longer one lives in the islands the more difficult it becomes to make generalizations about differences between Polynesians and Europeans. But there is I think, one which can be made which has a fair margin of truth, regarding the attitude towards living and the conditions around them. While it has been typical of Europeans that we endeavour to change the world around us to be "more nearer to the heart desire", so Polynesians generally change their own pattern of living or set of values to suit the existing circumstances. We might feel that this does not call for progress towards some great and noble ends but it does at least save them from the frustration of being without the myriad of trivialities which we find essential to carry on in the pattern which life in cities imposes on us.

I think it is this outlook that makes existence possible on an atoll in times of disaster from natural causes, particularly in the year or two which follows after a bad hurricane. With the exception of seafood, atolls do not yield very much that is palatable to most white men, except of course for the coconut, and it may seem that several white men who have lived much of their lives in atolls do not make as much use of the coconut as is common among atoll Polynesians. In most atolls of the Cook Group there are swamps, most of them artificially created from a natural depression where taro, puraka, and sometimes a few other vegetables are grown. But in none of these islands could it be said that these vegetables form a staple part of the diet. They are never grown in sufficient quantity to play the same important part in diet as one finds in the high islands where taro is a staple food.

When the making of copra is profitable it has long been customary for local vessels to buy it and generally to leave in exchange such staple foods as white flour, sugar, rice, with tinned boiled beef, herrings in tomato sauce, jams and canned fruits, all luxuries to be bought in times of plenty. When I first lived on an atoll, copra had long since been uneconomical to produce, and there had been no schooner in nearly four years. Imported foodstuffs had been long forgotten and such items as were really considered essential were imported clothes, machine-made fish-hooks and lines, and steel knives. Most other luxuries of a trading store could be substituted or improvised fairly satisfactorily.

Clothes were perhaps the last item that the people were unwilling to attempt to make from local material. This may seem rather odd in an island where clothes are not a necessity for warmth or protection from the weather. Nor do the people value clothes in a social sense to the same extent that a more sophisticated people might. Yet there were people who were unable to go outdoors by day as they had insufficient ragged clothes left to make the most modest of short pants or dresses.

My suggestions that as they already wove very beautiful hats from the coconut fibre, it would be a simple matter similarly to make short pants and a singlet or a pareu were greeted with much astonishment. Apparently the social value of European machine-woven material was dear to them, and the step of going "backwards", as they felt, to the grass skirt, no matter how well made, was a far bigger jump than they were prepared to take. Had the depression lasted longer it would have been interesting to know what dire necessity might have brought about.

I remember several girls who were wearing dresses made from old tarpaulins, sugar bags and even medical lint. These they preferred to clothes made from island materials.

In all other respects the people were quite happy to improvise, and the time factor, which imposes such a strain on our form of society, was of course absent. There were times when spears were made by first of all locating an iron bolt from a wreck, lying imbedded in coral. Diving it up, making a forge from materials at hand, heating and beating an inch and a half bolt down to a three-eighths-inch rod from which fish spears could be forged, was a tremendous labour that lasted several days and required heavy manual labour with a sledge hammer.

Hand forging fish hooks, making nails, knives and small tools, were all interesting tasks which took a lot of time out

* Mr. Powell is now a resident of Rarotonga, capital of the Cook Islands.

of all proportion to their value in a machine-age economy. Life in an atoll under such conditions was never an idle one. The labour of living at a subsistence level there was far greater than it would have been in a city. An excellent place to start studying economics. Then, I well remembered the thousands of beautiful shiny nails that in civilization were wasted everywhere. And the well-shaped and polished fish hooks that were so cheap as to be hardly worth considering their cost, yet to duplicate by hand were a labour indeed.

Several years ago it did seem then that health depended on a balanced diet and that certain vital foods were essential if one were to stay normally healthy, particularly in the tropics. My first thoughts were to plant ample vegetables, and whatever fruit trees that could be made to grow under atoll conditions. I took along seeds of pumpkins, corn, lettuce, multiplying onions, tomatoes, climbing beans, as well as cuttings of maniota, taro, tarua, bananas, citrus, snow fruit, jack fruit, pawpaws, breadfruit, as well as a variety of flowering plants.

The centre of the island had been excavated down to water level (which incidentally is tidal) and soil was then brought in until the level of the top was about fifteen inches above the higher level of the water which surrounded each square. The soil was kept from washing into the ditches around each patch by coconut logs, and taro was then planted, much as is common in high islands. In this island there was fortunately a good stand of Tamanu trees (*Callophyllum inophyllum*) and over the years a rich loam had collected. This was sifted and brought into the patch by wheel-barrows.

A little soil I was able to bring in from Rarotonga was a great help. When the first planting was done, alternate rows with and without the addition of a little of this high island soil were planted. There was a marked improvement in growth where it was used.

Compost fish manure, pig manure, and wood ashes were all added in time, as they became available. The soil needed constant turning with a fork as it quickly compacted and became mouldy, with a white fungus, if left too long. One could quite easily detect a change in the smell of soil which was frequently turned and forked over, the sunlight killing the mould.

Such a system worked out well. The soil was irrigated from underneath and the roots went down into the water. Even in the hottest, driest weather, plants grew equally well. Sweet corn grew with tomatoes, green beans, pineapples, onions, everything in fact that could normally be expected to grow.

The only difficulty was the limit to the area which could be cultivated. Expanding the area much more meant a tremendous labour of shovelling tons of soil and there was also the big problem of finding sufficient good soil to replace and plant in.

At this stage I endeavoured to dig over areas on a higher level and plant cowpeas as a start towards utilizing the best of the centre of the island, without the tremendous hand labour of digging an area down to water level, which was generally from twelve to fourteen feet. On the higher level all attempts to grow vegetables failed. The cowpeas grew up about six inches but died off. The citrus stayed alive but would not grow. The "kape", which normally grows in cool shady valleys in the high islands, grew better than anything else in the poor dry soil.

When planting breadfruit I had gone to a lot of trouble to dig out a hole about eight feet square by six feet deep and fill it with the best of materials I could find underneath, with enough soil on the surface to get the trees started. The method was not successful. On digging these trees out later I found that the rich or moister soil had attracted the roots of all the larger trees in that area, and that the breadfruit roots were so thickly matted with other roots as to make growth impossible.

CORRESPONDENCE INVITED

The "SPC Quarterly Bulletin" is a magazine to serve the interests and needs of Pacific Islands people. Readers are cordially invited to contribute letters on topics of general interest to its columns. Photographs will also be welcomed (prints and/or negatives will be promptly returned after use).

Correspondence should be addressed to:

The Editor,
SPC Quarterly Bulletin,
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SYDNEY, AUSTRALIA.

The reactions of the Polynesians to these efforts were interesting, for while they were always willing enough to assist in the planting, they were never interested enough to make the effort on their own sections of land, At times I made distributions of seeds and plants, but I soon found that they preferred to eat them rather than plant them. I was amazed, as it did seem to me then that the addition of ample vegetables and fruit would make a big difference to living conditions on an atoll.

This of course is what I meant earlier when I said that a European endeavours to change conditions to suit himself.

Then the hurricane struck. Within twenty-four hours the sea had destroyed almost everything on the atoll. Material possessions were scattered and lost, houses blown down and a general destruction ensued in the village that changed the face of the atoll.

From then on I was to learn what made life possible in atolls, and how Polynesians had managed to exist for centuries on land which yielded so very little. A hurricane leaves an appearance behind as though fire had destroyed everything. Coconut trees were largely shorn of leaves (the few remaining appearing as though having been burnt by fire) and every coconut was stripped from them. Under such conditions it was not reasonable to expect any new nuts to grow under a year or two.

When the sea does not wash an atoll completely away, as sometimes does happen, it does wash a lot of heavy cover over the centre of the island. It was under this pile of broken and twisted trees that most of the coconuts were buried. For a month or more it was still possible to find a few green nuts which could be eaten. Then the search became harder, and finally the supply of nuts which could be collected came down until they had to be rationed out to five coconuts per person each week.

A few pigs and chickens had survived the wind and sea and it was imperative these be saved for breeding. With so few coconuts, rations for the stock had to be made up with sea foods. Before the week was out the coconuts were finished and the stock had to be fed on fish only. It was surprising to find then that although the people were able to exist on several days of fish eating a week, the pigs could not survive. As long as cononut could be added they would eat, but when there was nothing left but fish they would not eat at all, and had to be killed.

The fallen coconut trees of course supplied some source of food in the "kamuka" or millionaire salad, which grows in the centre of the crown. The softer parts of the coconut husk could be eaten by some people, as could the young roots of the pandanus ("nono").

The last hurricane food then became the centre of the uprooted pandanus trees. This is something similar to the heart of the coconut palm. Preparing it for food is much more difficult, as it is very irritating in the raw state. The kamuka is chopped out and grated and is then well washed in the lagoon. After repeated washing it is rinsed in fresh water and then, if there is a little flour or arrowroot available, sufficient is added just to bind the grated heart. The whole is then baked in an "umu", or oven of hot stones, and the result is, under such conditions, quite a luxury.

The effect of this starvation diet was

never serious. We kept well enough, and as no ships came there were no infections, and the people stayed remarkably healthy. When, however, supplies ran really low, some help was asked from Rarotonga by radio, and the first schooner which arrived brought some hurricane relief in the form of six sacks of "maniota" starch.

For a few days this was quite a luxury, and everyone ate it boiled or baked in an "umu". The change in diet soon caused an outbreak of boils, however, and there were few people left who were not stricken with one or more. In consequence, people ate their maniota more sparingly, and the last boils vanished when the first of the coconuts were large enough to be picked, more than a year later.

The experience had taught me much about the attitude to food and the ability of Polynesians to stay healthy and happy under such adverse conditions. When insufficient food was available, the strain of having to work to a timetable was not there. The fear of death from starvation or disaster from malnutrition was never considered.

Now that copra is again valuable, imported foodstuffs form a regular item of most meals. White flour, sugar, coffee, tinned herrings all find their way into atoll fare. For anyone living on an atoll it is probable that most would have a depression where a minimum of excavating would provide an area for soil to build up where an irrigated vegetable garden would provide the bulk of a European family's needs in the way of fruit and vegetables. But as I see the problem, for the Polynesian the difficulty of existence is one with which he is well able to cope within the life pattern of an atoll. Once this pattern is broken I feel that living would not be possible. Thus, if anything is done to change the way of life in the atolls, much thought and consideration should be given to the problem before any great changes are made.

There have been disastrous hurricanes which have reduced the population down to a few people. In Puka Puka the present people can trace their ancestry back to fourteen graves of the last survivors of a hurricane which swept the island and the whole population into the sea. One can well imagine that these survivors must have lived entirely on fish for over a year before anything green grew again. It is unlikely that the coconuts or even pandanus were as thickly planted as at present.

EDITOR'S NOTE: Botanical names for the plants cited by the author are: Taro—*Colocasia esculenta*; puraka——*Cyrtosperma chamissonis*; maniota—*Manihot esculenta*; tarua—*Xanthosoma sagittifolium;* snow fruit—*Arnona muricuta*; jack fruit—*Artocarpus integrifolia.*

Para — A Former Staple Food Plant of the Polynesians

In ancient Polynesia, foraging was an important means of adding to the supply of food. Among the vegetable foods obtained in this way was a fern called "Para" (*Marottia pexinea,* Sm.). This species was mentioned in the article in the series on Pacific subsistence crops, published in the October *Bulletin.*

Readers may be interested in the accompanying illustration, reproduced from a photograph taken by the author at the mid-point of a journey across the island of Tahiti. One can clearly see the short, swollen stalk, cut lengthwise,

which was used as a food. It needed to be pounded before cooking and eating, and the instrument used for this work was characteristic of the material culture of many Polynesian islands, as well as that of the New Zealand Maori. —JACQUES BARRAU.

Mechanizing Coconut Cultivation

(*Continued from Page 22*)

difficult to solve; important, because of its effect on lowering production costs, and difficult to solve, because it requires an outlay of capital such as planters can rarely afford.

For this reason we consider that the question should be dealt with as part of a general plan for improving the coconut industry which would include, on the side of mechanization, the establishment of a co-operative system for the use of agricultural equipment.

When one stops to consider that replacing the natural dropping of the nuts by artificially-induced dropping results in an increase in copra yields of about 20%, mechanization of coconut growing would, if only in this respect, appear to be an economic proposition in the area. However, despite this favourable indication, it is certain that in the present state of agricultural and economic evolution in the area, an undertaking of this type would not be assured of success unless afforded the technical and financial support of the territories concerned.

Technical Publications in Social Development

The Commission's Executive Officer for Social Development maintains a small stock of technical publications which will be sent on request to specialist officers working in Pacific territories. Requests should be addressed to Box 5254, G.P.O., Sydney, Australia.

The service regularly includes such periodicals as *Community Development Bulletin, Fundamental Education — A Quarterly Bulletin, South Pacific* and *Pacific Islands Education.* Individual publications received recently are:

No. 172

The Samaka Guide to supplementary subsistence farming. Presented by the San Miguel Brewery, Inc., Manila, Philippines, 1954. 52 pp., illus. A booklet produced for the Philippine Rural Reconstruction Movement to help in its barrio betterment work. It is designed to help farmers who wish to "raise more vegetables and fruits and have better livestock and poultry for their table". It is written in English "understandable by the average literate Fourth Grader".

No. 173

The Philippine Community School Training Centre at Bayambang: a joint project of Unesco and the Philippines. By F. Fresnoza. Manila, Unesco National Commission of the Philippines, 1954. 51 p., illus.

No. 174

International Review of Education. Hamburg, Unesco Institute for Education. A new quarterly recording developments of international significance in educational theory and practice.

No. 175

Reviens à la vie: l'évolués congolaise contre l'alcoolisme. Editions du Service de l'Information du Gouvernement Général, Kalina, 1953. (Brochure No. 5.) 103 p. illus. An interesting pamphlet on the control of consumption of alcohol by native people prepared for use in the Belgian Congo.

No. 176

BELSHAW, C. S. *In search of wealth: a study of the emergence of commercial operations in the Melanesian society of Southeastern Papua.* American Anthropological Association. Memoir No. 80, February, 1955. x, 88 p., illus., maps.

A detailed study of one section of Papua describing the standard of living of the people, their social relationships and their business enterprises. The author has endeavoured to assess the significance of the developments in this area to the general trend of economic advance in Melanesia.

No. 177

SPENCE, B. Build your own house: the owner builder guide. Pretoria, Government Printer, 1952-3. 74 pp., illus., diags., plans. A very well prepared book for people who know little about building, written in Easy English and produced in co-operation with the South African Department of Native Affairs and the National Housing and Planning Commission. Five house plans are included, as well as a "List of Hard Words" which explains terms commonly used in the building trades.

Economic Development Among the Mekeo

By JAMES McAULEY*

Established in the Mekeo district early in the century primarily as a subsistence crop, rice is now a major cash crop in the area, and as such is playing an increasingly important part in its economic development. Native societies operating on co-operative lines handle the buying, mechanized processing, and marketing of the main crop. For domestic use, rice is often still hand-milled with pestle and mortar, as shown at right.

THE Mekeo are a sub-coastal people living on the flood plain of the St. Joseph River. In 1954 they numbered 4,254, representing a natural increase of 2.6 per cent. over the year.

Many of the conditions for economic progress are present. Transport links with Port Moresby by water and by air are fairly good and capable of improvement. A road link is possible in the future. The internal road system is fair, but suffers during the wet months. The area is, by New Guinea standards, rather exceptionally fertile. There is plenty of land capable of more effective use.

Above all, the people are keenly interested in material progress through cash-cropping. Whether they yet possess an adequate motivation springing from a sufficiently high and continuous level of money wants[1] remains to be seen, but there is no doubt that a ferment of economic ambition is working. The cargo-cult outbreak in this area in 1941 may be taken as a symptom of frustrated economic ambitions. This type of reaction has not recurred, probably because the attention of the people has since been attracted to hopes of substantial improvement through rice cultivation.

Mekeo experience with growing rice began with the introduction of rice by the Sacred Heart Mission early in the century. It became a regular part of the subsistence pattern, with a small surplus for trading or sale. Then during the depression years of the thirties compulsory cultivation of half an acre of rice per taxable male was instituted in order to raise the money required for head-tax. In 1933 the surplus padi bought from the natives was 171 tons. Thereafter the recorded figures show a fluctuating decline. This enforced cultivation was not popular, but it left an impression of the commercial possibilities.

During the war, ANGAU produced rice in the area by mechanical means. This made a great impression on the people, and after the war they were full of ideas about mechanical production. In 1949 the Agricultural Department attempted to give these ideas form by creating Rural Progress Societies which would engage in mechanized rice production as a collective enterprise. This scheme was not a success, partly through inherent defects in the collectivist-mechanist approach,[2] partly through the decision not to make any immediate cash payments of dividend in order to build up capital funds.

The result was a decline of native confidence, withdrawal of interest, and a worsening of relations between the people and the Administration, which were already unsatisfactory because of certain historical circumstances.[3] It became necessary to undertake a reorganization of the scheme in the interests of general native administration no less than in the hope of increasing rice production.

Fundamental requirements of any reorganized scheme were: to produce a scheme which the people would regard as genuinely theirs, not a government manoeuvre to get cheap rice; to provide incentives sufficient to elicit continuous effort; to determine the role of mechanization; and to adopt a realistic attitude to the social unit which was to be the unit of production.

The new scheme was worked out in its essentials in time for the 1953-54 season. Its principal features are:

1. The collectivist approach has been abandoned. There is no attempt to dictate in advance what sort of social unit shall undertake production; this remains a matter for the choice of the people concerned.

2. Mechanical assistance in cultivation (but not in harvesting) is provided, if desired, by the Administration under a contract whose clauses cover: the dates by which the initial hand-clearing is to be completed by the cultivator, the dates by which each mechanical stage is to be completed by the Administration, and the charges for the hire of the machinery, with a clause relieving the cultivator in the event of loss from natural causes.

3. Spot-cash payment on delivery of rice to the mill is an essential part of the revised programme. This is necessary to create confidence in the scheme.

4. The Rural Progress Societies have been wound up and new native societies on co-operative lines have been set up under the Native Economic Development Ordinance. These societies are not concerned with rice production but solely with buying, processing and marketing. In order to enable them to provide spot-cash payments in the first year of operation, Treasury funds were made available to the societies, but this will not normally be continued.

5. The scheme is directly under the control of the Assistant District Officer, who co-ordinates the work of specialist agricultural officers and co-operative officers.

The new scheme had to contend with a good deal of initial distrust and lack of

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[1] Cf. some remarks by W. E. Tomasetti, the Assistant District Officer in charge of the area in **S.P.C. Quarterly Bulletin**, April, 1955, p. 32.

[2] See my article "Mechanization, Collectives and Native Agriculture", **South Pacific**, April, 1952, for an unfavourable estimate of these factors. C. S. Belshaw's "Recent History of Mekeo Society", **Oceania**, XXII, I, 1951, also relates to this period.

[3] See my article, "The Distance between the Government and the Governed": **South Pacific**, March, 1954, p. 818, for reference to attitudes arising out of forced labour requirements, which were abolished in 1949. In certain villages, resentment over alienations of land in the early days is, I believe, a contributing factor affecting native attitudes.

interest in the 1953-54 season. Very wisely, no attempt was made to push the unwilling into participation. In the event, 81.25 acres were mechanically cultivated under contract and approximately 96 acres were worked by hand labour, the total of 177.25 acres being larger than was expected. The time limit imposed by the contract on the grower for preparing the ground for mechanical cultivation was not strictly enforced by the Administration, but in one case, Eboa Village, there was so much indecision and delay that it was left out. Since all harvesting was done by hand other crops could be interplanted with the rice, and this was gradually done. Good weather ensured a satisfactory yield. Estimated yield from the mechanically-cultivated fields was 13.4 cwt. per acre.

The system of purchase adopted was as follows: The grower brought in (or in some cases was helped by government transport to bring in) the harvested ears. The threshing was done by the Government and charged at the rate of 1s. an hour against the Society. The Society then bought the padi at the fixed price of 3¾d. a lb. This was a relatively low price, which it may be possible to increase later. The spot-cash payment had a considerable effect upon native opinion throughout the area.

The Society then milled the rice at its own expense. This was done in some cases by using the mills originally acquired by the Rural Progress Societies and taken over by the new Native Societies. However, these mills are not very efficient and result in a loss of 40-45 per cent. of weight. The Administration has a Kyowa mill at Beipa which gave only a 25 per cent. loss, and some of the rice was put through this, the Society being charged at an hourly rate for use of the mill.

The Societies then sold the milled rice at 9¾d. a lb., making a profit of approximately 1½d. a lb. after meeting costs of processing and transport. About 80 tons of milled brown rice were sold. It is estimated that the growers retained 10 per cent. of their crop for domestic use or local trading. About 1,500 people took part in production.

Much interest attached to noting what social units were chosen by the people as units of production. The units chosen varied from the individual up to a combination of clans. In the larger units, when the ground was prepared and planted it was generally divided into family blocks for weeding, and interplanting. The harvesting, however, was done by all together and was a festive occasion.

The total rice purchase by the Mekeo Native Societies from the growers for the 1953-54 season was:

	£
Aipeana	1,181
Beipa	1,377
Inawi	334
Eboa	52
Inawaia	481
Jesubaibua	266
Total	£3,691

Some details from selected villages will give an idea of the working of the scheme in its initial year; but it is too early to say how things will later develop.

Beipa: This is a large village of 620 people. One clan, the Ongoifo'ina clan, cleared a field of 18.83 acres and the chief entered into a contract with the Administration for mechanical ploughing. The charges for this were: first ploughing, £46/3/10, second ploughing, £18/11/-, disc harrowing, £8/0/10½d., totalling £72/15/8½, or £3/17/3 per acre. The cost per head for the participating members was about 13s. 4d. The clan members decided to plant by hand rather than make use of a drill. This enabled interplanting to be done.

The field was then divided into family blocks, each family tending its own block. Harvesting was done by the clan as a whole. In addition to this clan venture, five fields were cultivated by hand. Of these, four were undertaken on a clan basis and divided up before the planting stage into family blocks. The fifth was cultivated by an extended family.

Aipeana: This village has 477 people. The clans Aivea and Vangu Opa united for the preparation of a field of 13.2 acres, which was mechanically ploughed under contract. The charges for two ploughings, two harrowings and drill planting were £71/6/11, or £5/8/1 per acre. At first the people were not greatly interested and the field was divided into family blocks only at a late stage when weeding had been neglected. The estimated yield was 19,445 lb of padi, of which 13,761 lb. was sold to the Society, the rest being kept for seed and subsistence. Another mechanically-cultivated field of 3.25 acres was developed by a leading individual, Kalolo Opn, joined by two clan brothers, and helped by three men from the village of Rarai (the basis of this association is not clear). He showed great interest and sold 12,459 lb. of padi

In addition, two fields were cultivated by hand, one by a combination of four clans and the other by one clan. These were divided into family blocks. From these two fields 33,285 lb. of padi was sold to the Society. The Society's total rice purchase of £1181 includes some transactions with growers from Oriropetana Village across the river.

The new season has witnessed an increased interest on the part of the people and consequent expansion of activity. The estimated acreages for 1954-55 are:

Cleared for mechanical cultivation	306
Area of the above actually planted	219
Area of the above not planted because of freak rains	87
Area under manual cultivation	120
Total area planted	339

It should be emphasized that the general scheme for agricultural development in the Mekeo is not confined to rice growing. Indeed, although rice has become an established interest and has shown itself capable of giving a cash return, I do not regard it as proved that rice is the best crop for the area. The Agricultural Department is fully alive to the need to examine all crop possibilities.

One other established commercial crop in the area is copra, and the new co-operative-type Native Societies have been handling this also. Membership of these societies is by one £5 share. Turnover of the six existing societies for the period September, 1954-March, 1955, is as follows:

Society	Store Sales	Copra Sales	Rice Sales	Total
Aipeana	300	634	1512	2446
Beipa	380	869	820	2069
Inawi	780	485	320	1585
Eboa	40	Nil[1]	25	65
Inawaia	200	Nil[1]	50	250
Jesubaibua	Nil	Nil	Nil	Nil
Total	1700	1988	2727	6415

In accordance with the usual policy of the Co-operative Section of the Department of District Services, the Mekeo Native Societies have been brought into a larger association which covers the whole Sub-District, though all the other Societies belong at present to one group, the coastal Roro-speaking people.

In the opinion of the Assistant District Officer in charge of the scheme, the future development of the scheme depends mainly on the level of cash needs of the people. At present the cash needs felt by the Mekeo are not high, and cash can be gained with little effort by trading trips to Port Moresby to sell betel nut, fruit, and other products to the town natives. Such a trip organized by a small group can nett £100. Nevertheless, the incentive appears adequate for a scheme on the present scale, and is bound to become intensified as new wants develop. The extension and intensification of schooling and other forms of education is always a major factor in the creation of wants, and the progress being made in this regard in this area is encouraging.

The effect of the revised scheme was not merely to increase rice production and to promote economic development. By comparing my observations of mid-1954 with those I made in 1949 and 1951, I should say that the improvement in relations between the people and the Administration has been considerable. I am informed by the Mission, too, that the scheme has in no way interfered with the people's relation to the Mission but has on the whole had a favourable effect. This is because of the good understanding that usually characterizes mission-government relations in this area.

[1] Copra sales were made subsequently in these two cases.

Cultivation Of The Banana

By J. C. GERLACH

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The banana has been an important food plant in the tropics for centuries. In view of the increasing interest in the commercial production of this wholesome fruit on several islands in the Pacific, a closer study of its cultivation seems worth while.

Three-bunched banana occurring on Upolu (W. Samoa).

IT is believed that the species belonging to the genus *Musa* producing edible fruit originated in Southern Asia. Today they are found throughout and even beyond the tropical belt. The Musaceae contain several valuable and interesting varieties. In the Philippines the *Musa textilis* Née (Abaca) is planted for its strong fibre, the well-known Manila hemp; the *M. Basjoo,* Sieb. and Zuck., in Japan is grown for the same purpose. The decorative Travellers Palm (*Ravenala madagascariensis,* Gmel.) is a related form, but quite a number of *Musa* varieties are grown for decorative purposes. For the botanist the *M. chiliocarpa,* Backer, is of interest. This variety, known in Indonesia as "pisang seribu" (thousand bananas) can produce bunches over six feet long, sometimes containing over 3000 small bananas. On the island of Upolu (W. Samoa) the author came across a variety (mutation?) with 2, 3 and 4 bunches of fruit per single stem (see photograph).

Best known, however, are the bananas and the plantains. The latter are considered to belong to the *M. paradisiaca* group, having fruit of a coarser texture, usually requiring cooking, while the banana (*M. sapientum* L.) is normally eaten as fresh fruit. There is still much confusion in the nomenclature of the *Musa*, but valuable contributions of some eminent botanists are gradually throwing more light on this matter. It is proved now, for example, that of the Cavendish group (*Musa Cavendishii,* Lamb = *M. sinensis,* Sweet. = *M. nana* Lour) five members have apparently originated from a common parent by a series of somatic mutations (Cheesman, Wardlaw and Spencer 1933).

Three members of this group—the Dwarf Cavendish, the Lacatan and the Robusta—have found fairly wide use as export bananas. In the West Indies they have replaced the Gross Michel because of their great resistance, indeed virtual immunity, to the notorious Panama Disease caused by the soil-borne fungus *Fusarium cubense*. The Cavendish group is also fairly resistant to lower temperatures and is for this reason, for example, cultivated in Queensland (Australia). Some species are reported to occur at an altitude of over 3,000 feet in the mountains of countries along the equator (Indonesia, East Africa).

A disadvantage of the Cavendish banana is that the plant is more susceptible than the Gross Michel to Leaf Spot (*Cercospora musae*). On the other hand it travels quite satisfactorily under bulk storage and gives a satisfactory yield of ripe fruit of good flavour, though fairly pale coloured. In general the plant requires a good soil, and is less adaptable to poor growing conditions. An interesting point in this respect is that one of the species (the Lacatan) is cultivated successfully on Niue Island, an upheaved coral rock, where the banana is grown in shallow soil pockets between coral outcrops. However, climatical conditions on Niue island are fairly favourable for banana growing, and the island apparently received a volcanic ash shower in former centuries.

There are several varieties with a much better flavour and also a more attractive appearance than the Cavendish, but most of them have a thin skin and are therefore liable to bruising, or ripen off too quickly once they are full grown, so that they are unsuitable for export. For local use, or where only short-distance transport is involved, such varieties as the Lady finger, in Malaya and Indonesia known as the "pisang mas", and other varieties cultivated in those countries such as the "pisang rajah" and "p. rajah sereh" (= p. susuh) would probably prove profitable in the Pacific. Of the plantains, the *M. paradisiaca var. corniculata* (Malay : pisang tanduk) whose fruits attain a size of over 18 inches and have good cooking qualities, merits introduction.

Requirements of the Banana

For a complete understanding of the requirements, it is necessary to give a brief description of the plant so that the grower may have some conception of its structure and of the different parts.

The portion of the plant above ground level consists almost entirely of leaves. The bases of the leaves are broadened and, growing in a spiral, they form together a more or less cylindrical or tapering pseudo-stem, or "false trunk", which can attain a height of over 20 feet, carrying a certain number of large-bladed leaves with prominent midribs on the underside of the leaf. The leaves develop centrally from a bulbous rhizome at or below ground level, which is the true stem. When the plant is full-grown, the stem grows through the centre of the cylindrical pseudo-stem terminating in the flower-stalk. This flower-stalk appears when the plant is 8-10 months old, and it requires from 2½-4 months to develop the fully-grown bunch. The inflorescence is bisexual, the vigour of the plant and climatic conditions limiting the number of hands developing on the bunch.

The large terminal bud, sometimes

Banana plantation on Upolu (W. Samoa).

called "bullock's heart", may be cut off at the cessation of fruit setting, which will concentrate all the vigour of the plant into the development of the fruit.

From the true stem, usually called corm, the new shoots or suckers emerge, which can be used for propagation. Most of the cultivated varieties are seedless, so that vegetative propagation is necessary. The root system developing on the corm is shallow, usually extending down not more than two feet, and consisting of fleshy cordlike main roots with a great mass of finer feeding roots. As with other monocotyledons, the horizontal roots grow quite near the surface and are consequently easily damaged by careless weeding or cultivation.

From this description it will be obvious that the plant is not very strongly anchored in the soil. It is therefore desirable to plant the young shoots sufficiently deep.

The corm is the storehouse for the food manufactured by the leaves, and has the function of providing new plants and nutrients for the development of the fruits. The leaves have a considerable surface area to catch the sunlight, but they are easily tattered by the wind. The starch production is then consequently reduced, resulting in smaller bunches. Bananas should therefore be planted in sheltered areas, or be protected against strong winds by windbreaks or shelter-belts.

Although the banana is fairly easy to grow in general, it appears that it is quite a selective plant when cultivated for commercial production, i.e., when maximum yields are to be obtained. Let us therefore consider the two fundamental factors for plant growth—climate and soil—in relation to the requirements of the banana.

The Climate

Bananas (and plantains) grow well between the annual isotherms of 20°C (= 68°F.), i.e., roughly between the 30th degree north and south of the Equator. The plant is frost-tender, the leaves, flowers and fruits being easily damaged by low temperatures. Below 60° F. the ripening process of the bunch is affected. On the other hand, the plant can stand temperatures over 100°F. as long as sufficient moisture is available. The ideal temperature seems to be between 70 and 95°F., particularly in combination with a high relative humidity.

The moisture requirement of the banana is high. Plenty of rain, preferably over 60 inches per annum with a good spread of the rainfall throughout the year, are of great importance in obtaining maximum yields. Where this factor is less favourable, much will depend on the moisture-retaining capacity of the soil and the groundwater table, unless special measures (irrigation, mulching) can be applied as a paying proposition. Althougn moisture requirement is high, the plant cannot stand stagnant water or prolonged flooding. Under those conditions a well-planned drainage system is essential.

As mentioned before, wind is an important climatic factor. Areas with strong and also dry winds should be avoided. Winds with a velocity of over 15 knots will tear the leaves to shreds and thus reduce the effective leaf surface, so important for the assimilation processes, while dry winds increase the evapotranspiration rate and tend to reduce growth.

It is strange that planters, while carefully selecting a site with suitable soil for their plantations, frequently tend to forget to check the climate in conjunction with the soil. Few take the trouble to analyze the climate properly, and omitting this, make themselves liable to serious disappointments.

There are of course several methods of analysis, but let us for example take the fairly simple system of rainfall analysis of Prof. Dr. Julius E. Mohr, who divides the monthly rainfall in three groups. Based on the fact that plants in the tropics do not benefit from a monthly precipitation of 60 m.m. (2.36 inches) or less, those months are called "dry months". A "wet month" has 100 m.m. (4 inches) or more, while the "moist months" have 60-100 m.m. rainfall. Studying the monthly rainfall figure of ten or more previous years of a certain area, one obtains not only an impression of the variability of the climate, but also whether the area is liable to droughts.

Comparing, for example, three stations in Western Samoa—Lotofaga, Tuasivi and Falealupo with long-term averages of respectively 159.67 inches, 112.37 inches and 99.04 inches—analyzed in this way (see graph on next page) we can draw some interesting conclusions. All three stations are situated on the coast.

Lotofaga appears to have quite a wet climate. There is plenty of rain throughout the year, and the risk of droughts is negligible. Tuasivi and Falealupo show a different picture. The average annual rainfall of both stations is favourable and does not differ very much, but it is evident that Tuasivi usually has only one dry month per year, while Faleapulo has a more pronounced dry season with periods of drought up to 4 dry months. The chance of a dry month at both stations in the driest half of the year expressed in percentages is:

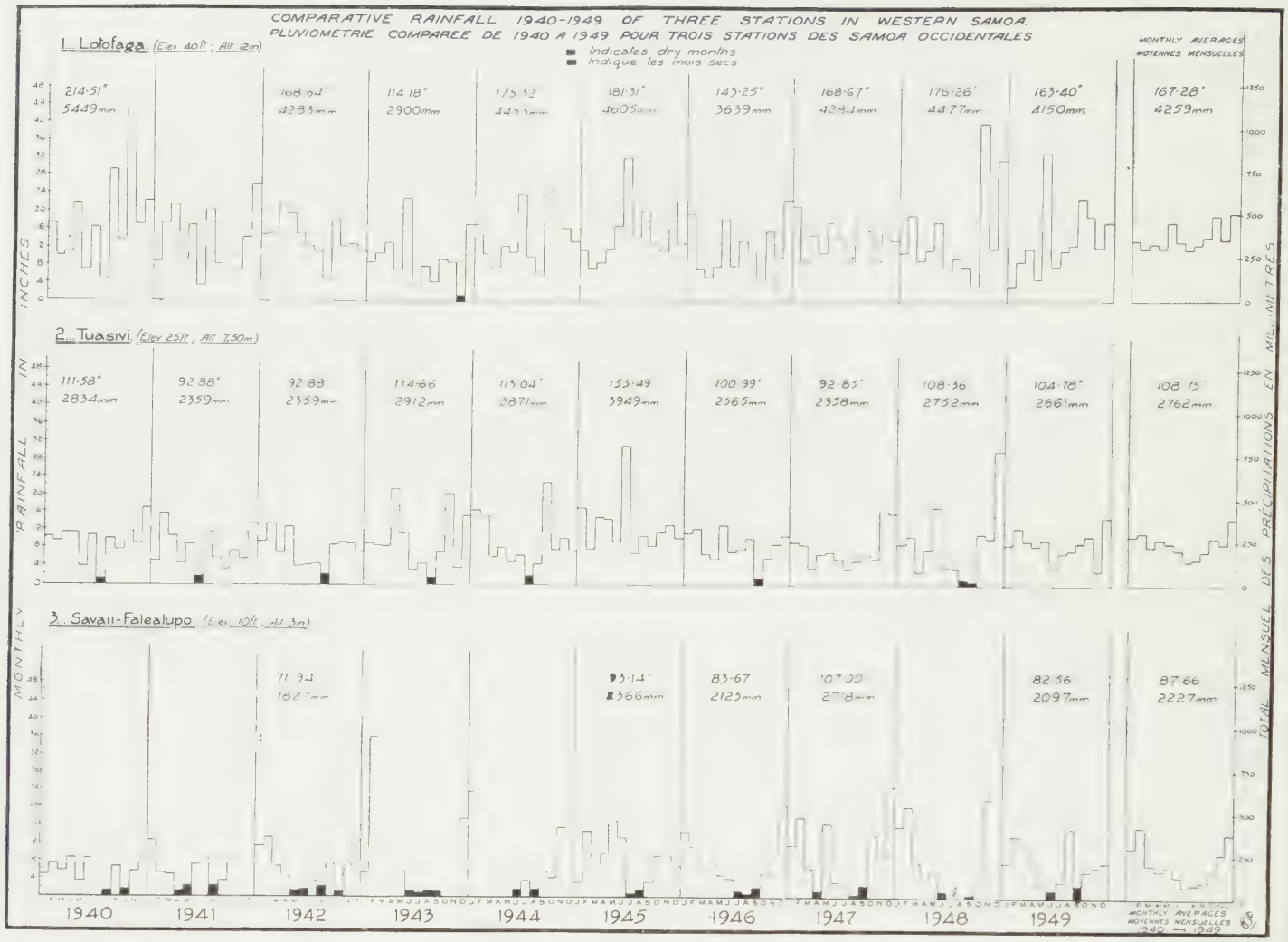
	MAY	JUNE	JULY	AUG.	SEPT.	OCT.
Tuasivi	0	10	20	30	20	0
Falealupo	20	50	40	70	50	20

The practical conclusions from this rainfall analysis for the planters in the three areas are:

Lotofaga: No risk of droughts, but the abundance of rainfall in some months (up to nearly 40 inches) will make it necessary to look into the drainage problem and might handicap plantation work.

Tuasivi: Only a slight risk of dry spells longer than one month; necessity of special measures depends on moisture retaining capacity of the soil and the groundwater table. Drainage might be necessary to cope with surplus rainfall in other months.

Falealupo: Drought conditions are likely to prevail from June to September, requiring special measures (irrigation, mulching) to obtain maximum yields, unless the soil condition and ground-



water table are favourable. Drainage might be necessary to cope with surplus precipitation in other months.

Summarising these conclusions brings out Tuasivi as the best area of the three for amount and spread of rainfall. The intensity of the rainfall can be gauged from the number of rain days in the wet months, whereas the meteorological records frequently show the outstanding amounts of precipitation per 24 hours. These data and the permeability of the soil will give an indication as to whether an intensive drainage system is required.

Another interesting aspect of climate which is of importance to the banana is the variability of the rainfall. Western Samoa is well off with a variability in the annual rainfall of only 18% (see C. J. Seelye in *New Zealand Journal of Science and Technology*, Vol. 32, No. 2, 1950). Other areas in the Pacific are in a less favourable situation. Nouméa has 30%, Papeete 46%, Ocean Island 48% and Malden (Line Islands) tops the list with a variability of 67%. For the planter on Ocean Island it means that in 5 out of 10 years he will have a rainfall deviating from the average. From the magnitude of the deviation can be gauged whether the area is suitable for bananas, or too risky.

These few points will have made it clear that it will pay a farmer who plans a banana plantation on a commercial scale to look into the climatical data as well as into the condition of the soil. For a land utilization plan the Agricultural Service should work out this problem for the local farmers in various districts, and base their advice on the results of such an analysis.

The Soil

The banana grows well on various soil types derived from a wide range of parent material. For optimum results a fertile soil rich in organic matter is required, fairly deep and well drained with a good moisture-retaining capacity. The rich alluvial deposits in the valleys of volcanic islands are often found to be most suitable for commercial plantations, as they often combine a good friable structure with a high content of nutrients and adequate permeability.

In practice bananas are found to grow in soils ranging from heavy clays to soils with a high percentage of gravel or sand, even in cracks of basaltic lava streams (Samoa) or shallow soil pockets in coral rock (Niue Island). If a few ratoons are cultivated for individual use most soils will do, but it is a different matter if maximum production is required.

For banana cultivation on a commercial scale, selection of the right soil type is of fundamental importance. The heavy clay soils often present the greatest problems to the planters, as carefully-planned drainage is required to carry off excess water in the rainy season, taking care on the other hand to avoid drying out the top layer during dry spells. It will be obvious that bananas should not be planted on pure sands or gravels, while heavily-eroded soils such as can be found sometimes on hilltops are equally unsuitable. If no proper information about the characteristics of the soil can be obtained it is advisable to plant some trial plots of 20-30 plants and attempt to correlate the growth and first-year

An example of the incorrect practice of planting too many crops with inadequate spacing. From left: Young cacao + dadap, young banana, young coconut (W. Samoa).

production of the different plots before deciding where to establish the plantation.

Planting Material

Since most of the *Musa* varieties cultivated for food production do not produce seed, the plant is usually propagated by shoots or other vegetative portions of the parent plant. A careful selection of planting material is essential as it has a considerable bearing on success or failure of the plantation. Whatever kind of material is selected, it is evident that it should be taken only from mature, healthy and vigorous growing plants. Although all planters agree on these two points, we find a great diversity in the kind of plant material used in various tropical countries. This diversity in choice might be due to different local conditions and a variation in the characteristics of different varieties.

Plant Material

Four kinds of plant material can be used:

(1) The whole corm of a plant which has already borne a bunch. Only 4-6 inches of the stem are left when the whole corm is planted, and one side bud is allowed to develop. This kind is seldom used.

(2) When shortage of plant material occurs, sections of a mature corm with a well-developed prominent "eye", centrally placed on the section, are carefully cut out with a sharp knife. The section should not be smaller than three inches in any dimension to ensure sufficient reserve of plant food for the young shoot until it has developed its own roots. To prevent rot the cut surfaces should be allowed to dry for one or two days before planting. In some countries this type of plant material is preferred to suckers for planting early in the season because of its rapid growth and the even stand obtained in the plantation.

(3) Most commonly used are the suckers, vigorous offshoots from the parent plant, two or more feet high with sword-like leaves, which are carefully cut with a part of the parent rhizome attached to them. This bulb should not be less than about three inches in diameter. Some planters prefer large suckers of up to 8 feet high, hoping to obtain an earlier yield. These 6-8 months old plants are mostly trimmed to 3-4 feet and planted as stumps. The use of such large suckers should, in the writer's opinion, be avoided, as larger shoots demand more energy to recover from transplanting and trimming. Consequently the first bunch is invariably a small one. There is the further risk that at that age the young inflorescence is already moving upward, so that deep trimming might damage the flowerstalk.

(4) It is, of course, a different matter if large suckers are used to develop a side bud. The sucker, preferably chosen from the top part of the ratoon, is trimmed down to 8-10 inches. The central shoot emerging is twisted or repeatedly removed to encourage a side bud to develop. There seems not much difference in result compared to the method described under (2).

One type of sucker should be discarded always—the so-called water-suckers. They can be recognized by the small bulb and fairly thin stem, while they develop wide leaves when still small. They have no vigour of growth, and produce as a rule small bunches.

Some planters stress the necessity to plant the suckers or other kind of plant material the same day or, at the latest, the following day; others leave the shoots in a shaded place in a heap or in bundles for a few days, even for several weeks, before planting. Although no hard and fast rule can be laid down for this point, as it depends very much on local conditions and the kind of plant material used, it should be kept in mind that immediate planting includes a greater risk of the fresh wounds being infected by diseases and pests, such as the Panama Disease or the Banana Weevil (*Cosmopolites sordidus*). Leaving the shoots lying about too long will, on the other hand, cause the plant material to dry out too much, or to decay in wet weather.

Preparation of the Land

Depending on the condition of the land and also of the soil, the methods of preparing the land for banana plantations differ considerably. Old rainforest on fertile soil is the best proposition. The underbrush is cutlassed, the bigger trees felled and preferably removed. The debris is left *in situ* to rot and the planting holes and, when necessary, drains can be dug immediately.

Where the soil is less fertile or heavy in texture, or when a younger secondary growth occurs, it is customary to cut the bush and burn it. The land is then ploughed, harrowed and drained before the planting holes are set out.

Some controversy exists about the question of burning versus non-burning the land before cropping. As the banana requires a high content of organic matter, it seems doubtful whether burning (and therefore destruction of the organic matter in the topsoil) would be beneficial. On the other hand, the heat of the fire would kill harmful insects and fungi and also weed seeds, while some potash becomes readily available to the young plant from the wood ashes. Both methods have their advantages and disadvantages, and some research work on this intricate problem is being carried out now in one of the New Zealand island territories to find a scientifically-based answer suitable for local conditions.

Previously-occupied land should always be tilled before being planted with bananas. When fertility is not up to standard, fertilizers should be applied to improve the condition. In this case it is worth while to find out first, by soil analysis, which elements are lacking before applying any fertilizer. Further, it should be kept in mind that the banana makes fairly heavy demands on the available plant food in the first 3-4 months after planting. The first application should therefore be given at or shortly after planting, with additional dressings

later on when new shoots are developing. The simplest way is to mix the fertilizer through the soil of the planting hole just before the suckers are planted out.

On land where the fertility level and organic matter are low, it pays to apply a leguminous cover crop for about a year before planting bananas. For this purpose several legumes can be used, provided they produce a sufficient amount of green matter. Pigeon peas (*Cajanus cajan*), *Crotalaria* spp., *Tephrosia* spp., cowpeas, and several others are suitable. Readily self-sowing species should be excluded for this purpose, as more weeding is required later on. The crop should be ploughed in when it starts flowering, or be pruned back, the prunings being left in between the rows as a mulch layer. This system will increase the nitrogen content of the soil, whereas the green manure will improve the structure of the topsoil. Leguminous crops are sometimes also grown in the plantation to improve the soil condition or to prevent erosion of the soil on sloping land. The leguminous crop should not be sown closer than 3-5 feet from the banana stools to prevent root competition.

Drainage can be quite a problem on the heavier soils, and also in hill country. In the latter areas contour drains are working more satisfactorily than small individual terraces, as they are more effective in reducing erosion. In countries with heavy rainfall the contour drains should be inter-connected by drains at an angle and occurring alternately, so as to slow down the waterflow. Under these conditions a cover crop will also help to reduce erosion.

In windy areas windbreaks should be planted as soon as possible to provide some shelter in readiness for when the young banana plants shoot up. Any dense foliaged tree is suitable as long as it does not grow too tall, shading the outer rows of bananas, or have too wide a lateral rooting system.

The next step is preparing the planting holes. As explained before, the plant should be anchored firmly in the ground to prevent toppling over. Another fact is that the young roots develop best in a loose-structured medium, rich in nutrients. For heavy soils, particularly, it is therefore very important to prepare the planting holes well. The holes should be dug at least 18 inches, but preferably two feet deep and 18 inches wide, the soil removed from the hole being allowed to weather for several weeks to a month, depending on the soil type. Shortly before planting, the soil is mixed with compost or fertilizers (if necessary), while in most cases it is an advantage to replace the subsoil from the hole with soil scraped from the surface around the hole.

Planting

Planting distances vary greatly, as they depend on the size of the variety used, the fertility of the soil and whether a pure stand or a mixed plantation is planned. Each planter must take these factors into account when working out the correct planting space. On flat land of less than moderate fertility a spacing of 10 x 10 feet (giving 435 plants to the acre) is adopted for average-sized varieties, while only one follower is allowed to develop on each mature plant. All other suckers are pruned off before they attain a height of one foot.

In more fertile soils the spacing should be increased to 12 x 12 feet (300 plants per acre) or 14 x 14 feet (220 plants per acre) with two followers per plant. Very fertile soils require a planting space up to 16 x 16 feet (170 plants per acre) and three followers can be allowed. Some planters prefer the triangular system to planting in squares in order to have more plants per acre, and to obtain a closed canopy discouraging weed growth.

For plantations on hillsides, the spacing should, of course, be adapted to the gradient of the slope; the steeper the slope, the greater should be the distance measured on the surface to allow the same space as on flat land.

In some countries bananas are used as a catch crop for cacao or other perennial crops. The young and tender cacao plants benefit in the first year or two from the shade of the banana plants, which bring in an early revenue. In such cases the spacing has to be adapted to the planting distance of the main crop. A common practice is to interplant bananas with starchy roots (*Colocasia* spp., and *Alocasia* spp.) until the canopy is closed.

When suckers are used as planting material, the planting hole should be partly refilled and the shoots planted about a foot deep, after which the filling up is completed. With corms or sections, the filling up of the hole is postponed until the bud has started to sprout and the top emerged above ground level. In home gardens the plant holes can be filled up with decomposed stable manure or compost made of house refuse, decaying leaves, etc., and poultry manure.

In countries with a pronounced dry season, planting should preferably be done when the wet season has set in properly to ensure a good start for the young plants. For areas with a very regular spread of rainfall, planting can be carried out practically throughout the year.

Plantation Husbandry

This includes a series of agricultural activities similar to those carried out for any other crop: weeding, cultivation, pruning, spraying, irrigation, etc.

With regard to bananas, a few of these points require special attention. Weeding and cultivation should be done very carefully to avoid damaging the shallow lateral roots developing around the stools. The same holds when applying fertilizers. The manure should be spread around the stool and forked in lightly.

Removal of suckers (pruning) is necessary to obtain well-developed bunches suitable for export. Home gardeners and villagers with small plantations for local consumption often neglect this practice. The stools (or mats) then become overcrowded with shoots, resulting in less-vigorous plants and consequently a smaller production.

An indication has been given earlier in this report of the relationship between spacing and the number of followers per stool. In practice the planter has to determine from the first yields what the carrying capacity of his land is. Several kinds of tools are used for pruning. It is essential that the surplus number and badly-placed shoots are cleanly cut off at the base before they are about a foot high. The cut should be deep enough into the corm to prevent the shoot from sprouting again. The object of pruning to a system of a motherplant and two followers, for example, is to have the first follower (first ratoon) reaching the crown of the motherplant when the latter is carrying a bunch. The second follower developing behind the first should then be about 18 inches high. The interval in ages between the motherplant and respective followers is then about four months.

Tall varieties carrying a heavy bunch sometimes require propping, particularly in the wet season, when strong winds frequently accompany heavy showers. Several appliances can be used, but one or two forked sticks placed under the neck of the bunch, the other end planted firmly in the soil, will in most cases give sufficient support.

Harvesting

For export purposes the bunch is harvested when the fruit is still green but fully grown, i.e., when they have lost their angular shape and the sides have rounded out. If intended for local use, and to obtain the best flavour, the owner waits until one or two fruits in the top hand show the first yellow streaks. However, fruit flies, birds, and other pests may prevent this practice. In any case, for export purposes the fruit has to be picked earlier with regard to the time spent on transport. Bananas picked when fruits still show prominent ribs have considerably less flavour and sometimes do not even ripen off properly.

The bunches should be cut with about a foot of the stem left above the fruit. This will facilitate handling and will

Food value of bananas and plantains

compared to other products, per 100 gram retail weight

	Calories	*Protein*	*Fat*	*Calcium*	*Iron*	*Vitamin A*	*Thiamine (Vit. B1)*	*Riboflavin*	*Niacin*	*Ascorbic Acid (Vit. C)*
	No.	%	%	*mg.*	*mg.*	*I.U.*	*mg.*	*mg.*	*mg.*	*mg.*
Bananas (*Musa sapientum*)	67	0.9	0.3	6	0.4	140	0.03	0.04	0.5	8
Plantains (*Musa paradisiaca*)	75	0.8	0.3	5	0.5	220	0.04	0.03	0.4	11
Oranges (*Citrus sinensis*)	32	0.6	0.1	24	0.3	120	0.06	0.02	0.1	36
Taro (*Colocasia* sp.)	86	1.5	0.2	19	0.9	0	0.12	0.02	0.7	4
Yam (*Dioscorea* sp.)	90	2.1	0.2	19	0.7	0	0.08	0.03	0.4	9

keep the fruit fresh while it ripens. It should be borne in mind that during the ripening process the fruit is still living and absorbing elements stored in the stem. The best method therefore is to ship bananas in the whole bunches in specially outfitted banana ships. However, difficulty in loading and lack of space have caused another practice in the only five territories in the Pacific which produce bananas for export. In these countries (Fiji, Western Samoa, Niue, Tonga and the Cook Islands exporting 3-500,000 cases annually to New Zealand) the bananas are torn off the bunches and packed singly in cases containing about 80 lbs. nett weight. Although the required shipping space is reduced considerably in this way, it is evident that the severance of the fruit from the bunch, and the consequent interruption of the natural sap flow from the stem, has a detrimental effect on the quality of the fruit. Further, there is a considerable risk of contamination of the open wound with spores of fungi, increasing the percentage of waste. Harvesting and subsequent handling of the fruit call for a great deal of care, as any bruises or damage shows clearly on the ripe fruit, detracting from the general appearance.

Yields

It is difficult to assess the yields of small individual plantations, but in commercial plantations the yield per acre and per year may vary from 7,000-14,000 pounds (measured in bunches), depending on local conditions and the variety planted.

When the bunch is removed the plant should be cut in small pieces and spread over the ground. Large pieces are liable to attract insect pests or may become a breeding ground for moulds. Where no serious pests and diseases occur the pieces can be applied as a mulch around the stool in the dry season. To prevent exhaustion of the soil, banana stools should, as a rule, not be kept longer than about four years. This rule is especially applicable for small individual plantations, where no proper pruning is applied. The number of years on commercial plantations could, in some cases, be extended by the regular application of adequate fertilizers.

Food Value

Bananas and plantains are mostly considered in the first place as good sources of starches and other carbohydrates. The ripe fruit, however, contains also appreciable amounts of minerals and vitamins, as can be seen from the above table extracted from a publication of the F.A.O. (*Food Composition Tables—Minerals and Vitamins,* by Ch. Chatfield, F.A.O. International Studies No. 11, March, 1954.)

Whereas the caloric value of bananas and plantains is only slightly less than that of taros and yams, the contents of vitamins A and C in the former are quite appreciable, the vitamin A content being even higher than that of oranges. Small wonder, then, that the banana is considered a wholesome fruit throughout the world.

Harvesting And Care Of Castor Seed

THE article by Mr. E. J. E. Lefort, Research Officer for Economic Development, South Pacific Commission, in the *Quarterly Bulletin* for January last, entitled "The Castor Plant: Its New Significance in Tropical and Sub-tropical Countries", induced the Agricultural Extension Service of Netherlands New Guinea to collect seeds from native stands of the castor plant and send them to the Tropical Products Department of the Royal Tropical Institute, Amsterdam, Netherlands, for examination. The results give occasion for the following additions to the article by Mr. Lefort.

In the table below the analyses of four samples have been assembled. The results have been discussed with manufacturers of castor oil in the Netherlands. The following facts have been established.

(a) The seeds may not be too small, as such seeds contain less oil (compare the first and second sample of the table); an oil content of not less than 47-48 per cent being desirable;

(b) the seeds must be bright, dull seeds containing less oil (compare the third sample and both samples No. 2434 at the end of the table);

(c) quality of the oil is influenced very rapidly and unfavourably by moisture, noticeable by an increase of the acid value or percentage of free fatty acids (compare the second and third sample with both samples No. 2434 recently harvested);

(d) after harvesting, the seeds must be dried rapidly and thoroughly and then stored in such a way that they cannot absorb moisture, i.e., not in direct contact with the floor or the ground, but at some distance above it.

From this list of "wants" it follows that it would be of considerable importance if varieties could be found ripening in a dry period, so that the seeds could be harvested while it lasted. In view of the sensitiveness to moisture, consignments should be shipped immediately they are ready, to America or Europe. Such measures should make possible favourable prices for the seed. As a rule it will be more difficult for smallholders to comply with these requirements than for plantations. However, co-operation may serve this end, making it also possible to clean the seeds before shipping.

Analysis of Samples of Castor Seed from Netherlands New Guinea

Sample No.	DESCRIPTION	Weight of thousand seeds	Moisture	Oil	Acid value of the oil	Free fatty acids, calculated as ricinoleic acid
2357	Large, red brown seeds	721 g	6.3%	54.5%	1.1	0.58
2426	Djarak* putih	143 g	6.6%	45.2%	1.5	0.80
2392	Djarak merah, harvested two months ago	363 g	6.2%	46.3%	1.2	0.64
2434–1	Djarak merah, recently harvested, seed with a bright colour	441 g	5.7%	50.5%	0.8	0.43
2434–2	Do., seed with a dull colour	334 g		45.5%	0.6	0.32

* *Local name for the castor plant.*

Prospects Are Promising For . . .

Bamboo Culture In The South Pacific

A botanist examines the potential contribution of bamboo to the economic development of the Pacific islands.

By F. A. McCLURE*

Bamboos by the million mean homes for millions. Chittagong, East Pakistan.

THE possible impact of the introduction of bamboo culture on the future economy of areas such as the Pacific islands is a matter deserving serious consideration. The importance of bamboo in the economic life of peoples in large areas of the Eastern Hemisphere and the steady emergence of bamboo into certain phases of modern industrial development such as papermaking and the fabrication of laminated bamboo products, not to mention the large potential (and at present very inadequately supplied) market in the United States for bamboo in diverse forms for interior finish, handicrafts, prefabricated picket fences, etc., leads to the assumption that bamboo might be used as an effective means of improving the domestic economy of the Pacific island peoples.

Bamboo occupies such an important place in the human economy of some regions, particularly in south-east Asia and adjacent islands, that the majority of the people would be utterly destitute without it. In vast areas bamboo is the one material that is sufficiently cheap and plentiful to fill the tremendous need for economical housing. It is at the same time so versatile that from it are made hundreds of objects in daily use in the home and in the pursuit of a livelihood. Moreover it requires no elaborate and costly machinery for its harvesting, or transportation, or for the manufacture from it of the thousand and one articles that fill the needs of the people. The general utility knife that every man possesses serves for all but the most refined operations.

The exploration of the potentialities of bamboo as an expanding resource for the Pacific island peoples calls for judgments based on past experience in numerous fields or disciplines, and for exploratory activities of several kinds.

The number of localities and their degree of dispersion as well as the total area in which operations may be undertaken will be determined by the funds and personnel time that may be allotted to the enterprise. The actual selection of particular communities and areas will require a careful consideration of ecological and economic settings. These must be evaluated in terms of immediate needs and calculated potentialities. Immediate needs may relate to the land: need of conservation of soil and water, need to improve existing patterns of utilization, etc. Immediate needs may characterize the state of the populace: need of new sources of income, new incentives, new perspectives.

Consideration of Limiting Factors Important

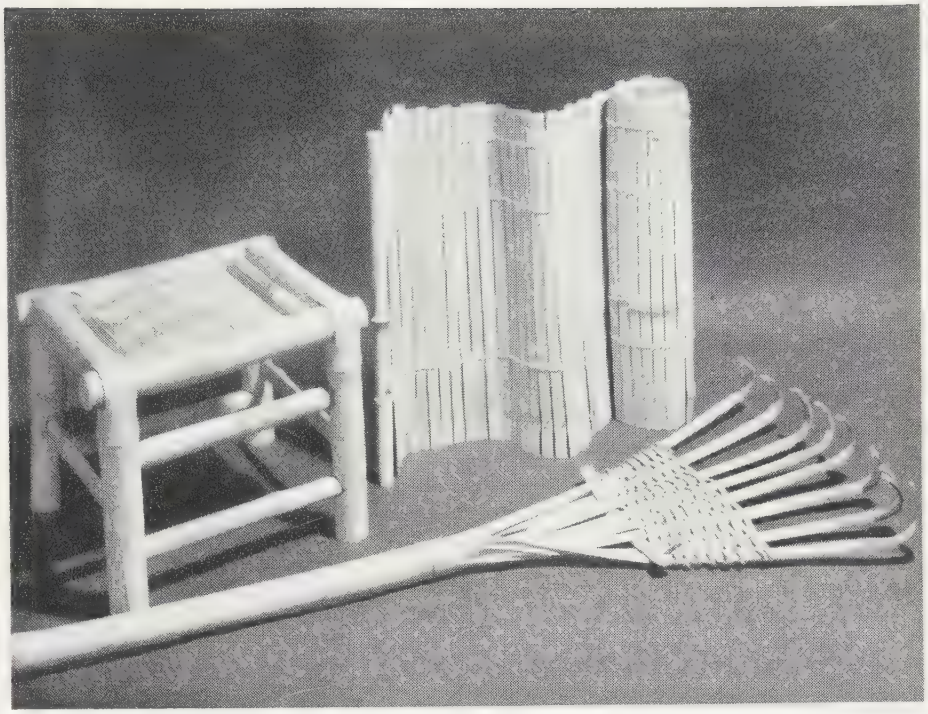
Limiting factors must be weighed. Among these will be the nature and extent of the land area available to a given community. Low annual precipitation, inadequately-developed (geologically young) soil, and high salinity are apt to be encountered frequently. Any one of these factors could exclude the possibility of growing bamboo. It is not possible, however, to give the precise boundary at which each alone, or any combination of them, may operate to block the successful cultivation of bamboo or make its trial inadvisable. There are indications that certain bamboos will tolerate unrecorded extremes of drought: *Dendrocalamus strictus, Bambusa vulgaris* and *B. ventricosa*, for example. The degree of tolerance to salinity that any bamboo may display has not been studied. It is presumed, however, that initial activities will be undertaken where the conditions at least appear to be favourable.

As a first step, a survey to determine the identity, condition, abundance and utility of the bamboos already introduced in the Pacific islands would be of the greatest value. This information would obviate the waste involved in introducing valuable kinds already locally available. A perspective comparable to some years of actual experience could be developed by an on-the-spot study of the history of their introduction and the present state of the plants, as well as the nature, extent and success of their exploitation in the local economy.

The chances for improving land-use patterns, and local opportunities for utilizing bamboo, will vary from area to area.

Considering the growing of bamboo as it relates to the needs of the land, we may first discuss the land-use angle briefly. Oriental bamboo growers claim that the technical properties and lasting qualities of a given bamboo are generally superior when the plants are grown on soil of somewhat inferior fertility. They counsel against fertilizing a bamboo plant that is grown for its culms alone. From

* Botanist, Section of Plant Introduction, U.S. Department of Agriculture.



Bamboo, light, tough, and easily worked, lends a special charm to a thousand common articles of daily use in China and Japan.

this it is to be inferred that it may be undesirable, as well as economically unsound, to utilize the most fertile agricultural lands for the cultivation of bamboos for timber production.

In the cultivation of tropical bamboos for the production of edible shoots, friability of the soil is of greater importance than fertility. The annual operations of clump renovation and subsequent hilling up of the earth around the base of the clump to etiolate the shoots are performed with greater ease and effectiveness if the soil is not too heavy. The application of prescribed soil amendments at the right times and in the right amounts to get maximum yield and quality is elsewhere considered sound and economical practice. But it must be tested afresh under each new or distinct combination of ecological and economic and human factors.

Very little has been written about the potentialities of bamboo as a stabilizer of soil and controller of run-off from the angle of soil and water conservation or watershed stabilization. The dense shade cast by the plants keeps competition from weedy growth to a minimum. The abundant annual leaf-fall develops a deep mulch under the plants. This conserves moisture, contributes to the development of favorable conditions for the building of good soil, and promotes normal development of the plant. Furthermore, the culms may be harvested without seriously disturbing the mulch or the soil. I know of no other type of plant growth that can yield an annual crop and at the same time serve as an effective year-round long-term protector of watersheds.

Considering bamboo as it relates to the needs of the people, it will be useful to study the exploitation of bamboos from two distinct angles: that of present and potential uses in the immediate community, and that of export possibilities. Uses important in one cultural or economic setting might be viewed with no more than curiosity by persons from another milieu. Objects that have no use, application or value in the place where they are fabricated may bring a substantial price if exported to another area where either the bamboos are lacking or the essential skills have not been acquired, or labor costs are too high.

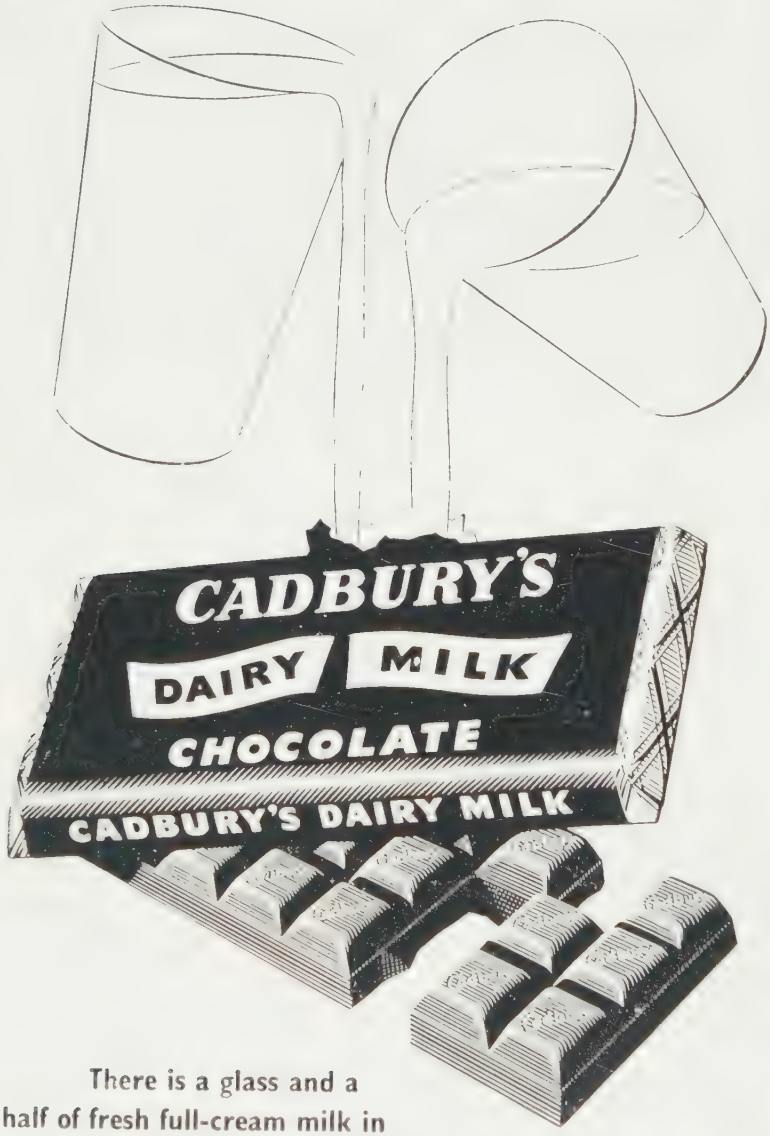
Useful for Islands Fishermen

Island peoples often make a living from fishing. By virtue of its versatility bamboo can supply a great many of the fisherman's needs. This has been demonstrated dramatically by the Chinese. If one looks up names relating to fishing in a Chinese dictionary it will be found that a great many of these complex terms (ideographs and pictographs) contain the symbol for bamboo. This fact signifies that even before their names were first reduced to writing, bamboo was employed in the making of the devices themselves. To mention only a few of them: traps, weirs, sluices, barriers, poles for hook-and-line fishing, spears, sea-anchors, floats, trays and poles for drying fish and baskets for transporting them, netting needles, poles for drying nets, punting poles, scaff- or dip-nets, including karojals, salambas, etc. The dredges, punting-poles, sieves and sea-anchors of Oriental clam-dredging equipment are all made of bamboo.

Other uses may interest other sections of the population. Living plants of bamboo with suitable growth habit may be used for hedges, screens and windbreaks. Culms from certain bamboos may be used to build houses, granaries, bridges, fences, corrals; furniture and household utensils of all descriptions; rain gutters and water-conducting pipes. They can supply withes for the fabrication of

A bamboo house can be light, airy and attractive, a place for comfortable living. West Bengal, India.

The sign of good chocolate



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cables both heavy and light, and woven ware such as basketry, matting, sieves and trays. Coarser strips make sturdy crates for shipping pigs and poultry and garden produce; excelsior-like scrapings serve for stuffing pillows and mattresses, for caulking boats and toughening plaster. Refined fibres yield cellulose for paper or rayon; crude fibres are used for making cordage and sandals. Poles of various sizes are used for making ladders, lining-out poles, stakes for supporting trees, tool handles, rakes and miscellaneous garden needs.

Uses For Foliage

The foliage of many bamboos is used as a major or supplementary source of fodder and bedding for livestock. The unopened leaves are used to make a cooling tea, probably rich in vitamin C. The branches of certain kinds make excellent brooms for outdoor sweeping. The culm-sheaths, when of suitable size and texture, find many uses; lining sun and rain-stopping hats, awnings and shipping baskets, and for making sandals. In India the hard, even-grained rhizome of a common species of *Dendrocalamus* is used to make polo balls.

An objective which will have validity and pertinence, in the light of the foregoing observations, is that of locating and assembling an ample array of those kinds of bamboos that give promise of thriving here and there under given local conditions, and at the same time present technical characters that fit them for exploitation somewhere along the wide range of uses that could be cited.

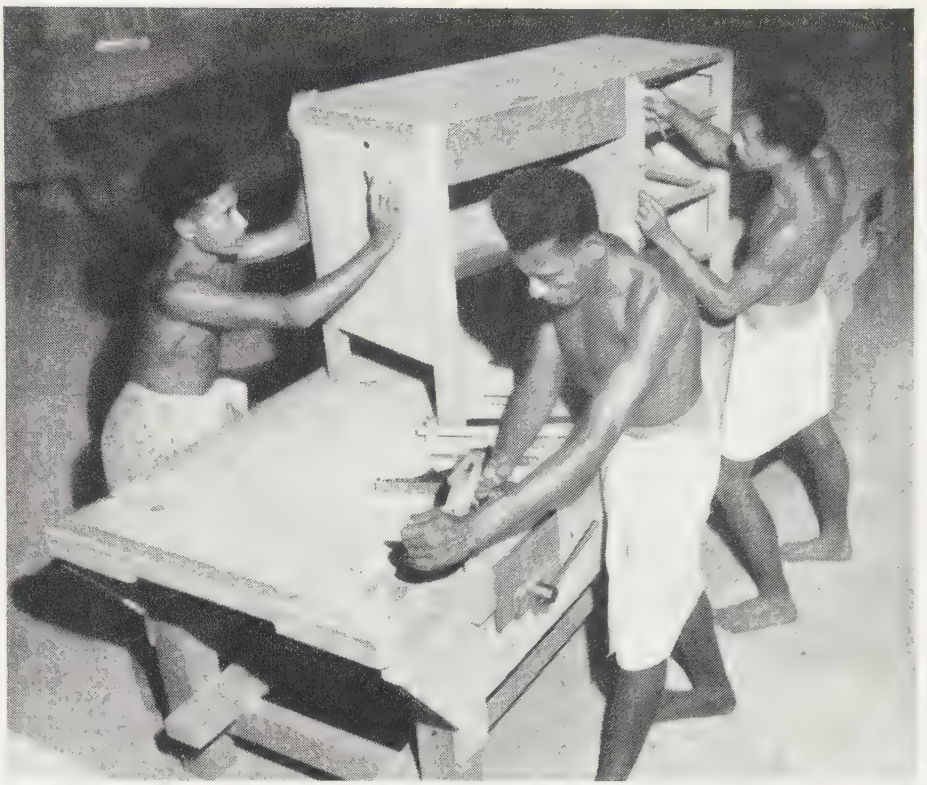
Once established under favorable environmental conditions, bamboos generally require little or no attention beyond occasional thinning to keep the clumps in vigorous condition. If they are sufficiently well adapted, they will not die from lack of care, and they will always be there for experimental studies, propagation, and for future use if and when changing conditions or new technical developments open the way for additional channels of exploitation. It seems reasonable to suggest that living collections should be studied in a wide variety of ecological conditions, keeping in mind the dual function (production and conservation) as well as the basic principles of land utilization. After production has become commensurate with the local needs it may be desirable to undertake to supply outside demands as well.

PICTURE CREDITS

Acknowledgment is made for photographs in this issue, as follows: Page 9, process engraving loaned by *La France Australe*, Noumea; front cover, pp. 15 and 41, Australian Official; pp. 24 and 25, Netherlands Information Service; p. 27, chart reproduced by courtesy of the Mitchell Library, Sydney.

Technical Training Aids For Pacific Teachers

To assist those concerned with the technical training of Pacific islanders, the South Pacific Commission has set up a clearing-house service for vocational training materials, including publications of all kinds, filmstrips, and posters.



Vocational training in Papua. Boys in a carpentry class of the Idubada Technical Training School (near Port Moresby) putting the finishing touches to a desk. Basic subjects taught are carpentry, plumbing, mechanical work, boot repairing, cane work, and electricity.

THE need for technical training for native peoples in the Pacific area has become increasingly apparent in recent years because of the growing demand for skilled tradesmen in most territories. Many islanders have already acquired considerable knowledge of various trades by learning "on the job", but systematic training in schools and colleges as well as practical experience is necessary to produce skilled tradesmen.

Much progress towards providing this training has been made since the war, with the establishment of new technical schools and colleges in some territories and the introduction of new technical courses in existing schools in others.

One of the difficulties encountered in these training courses is the lack of suitable books and other teaching materials on technical subjects. Many of the books used in technical training institutions in the metropolitan countries are unsatisfactory, because they assume a higher level of technical and general education than has been attained by most native students, and teachers concerned with technical training in the Pacific have little opportunity of examining more than a fraction of the vast numbers of technical publications available in order to select more suitable material.

To help in overcoming this problem, the South Pacific Commission, in October, 1954, adopted its Research Council's suggestion of conducting a small clearing-house service for vocational training materials. The service is designed to locate and make known teaching aids from any part of the world which give promise of being useful in technical training in Pacific territories, and, if possible, to arrange for some new materials to be prepared and published.

The first stage in this service has been to collect booklets, charts and filmstrips which may be suitable for use in the islands. Most of the material is on trades subjects, including carpentry, brick-laying, electric wiring, fitting and turning, motor maintenance, radio operation and repair, plumbing, welding and commercial subjects. Some teaching aids have also been included on general science, which is basic to most trades, and on domestic science and handcrafts.

To meet the most urgent territorial needs, every effort has been made to select books which are fairly elementary, well illustrated and written in simple English. Catalogues of all the leading publishers of technical books have been consulted, technical departments of large bookstores have been inspected, and advice has been sought from educationists and from technical schools and colleges in Africa, South-East Asia and the West Indies.

One of the educationists consulted, Dr. John E. Ludington, of the U.S. Office of Education, obtained for the Commission copies of about 70 books published in the U.S.A., selected from some hundreds of books on technical subjects which he examined.

Replies from most technical schools and colleges in Africa and similar areas showed that they, too, are experiencing difficulty in finding suitable teaching materials, especially for the less advanced technical classes. They were, however, able to suggest some publications which they had found helpful; and they sent the Commission copies of their syllabi for technical courses, which may be of interest to schools and colleges in the Pacific area planning new courses.

Copies of about 150 different books, 25 filmstrips and 12 sets of posters have so far been collected at the Commission's Social Development section office in Sydney. A few examples are:—

Electricity and Its Uses, by W. E. Flood. London, Science in the Modern World series, Longmans, 1950. 137 pages, illustrated.

Basic Woodwork, by Geoffrey Fiennes. Cape Town, Longmans. 62 pages, illustrated.

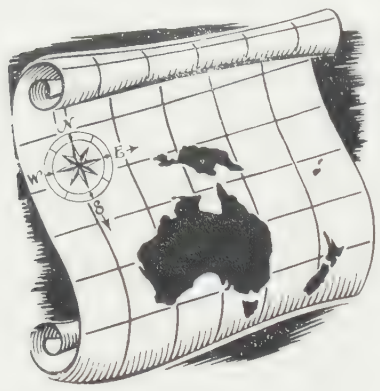
The Diesel Engine—How It Works, by Kenneth Hunt. London, Cassell, 1954. 32 pages, illustrated.

Keep Your Tractor Working For You! Filmstrips in colour, produced by Massey-Harris Co., Racine, Wisconsin, U.S.A.

Carpentry—Saws, Chisels and Gouges. Filmstrip in black and white, produced by the Unicorn Head Visual Aids Ltd., London.

Stanley Tools. Set of 38 posters in black and white on the use of common tools, produced by Stanley Works G.B. Ltd., Sheffield, England.

Lists of all this material have now been sent to Directors of Education in



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Pacific territories, and to other technical education officers and mission schools already nominated by them. The officers receiving these lists have been asked to specify which of the books, charts and filmstrips they would like the Commission to send them for inspection. Multiple copies of over half the books are held in the clearing-house, so that requests from a number of territories can be met at the one time; other items (including all the filmstrips and most of the posters), of which only one copy each is held, will be sent in turn on loan to territorial officers asking to see them.

The Commission has also asked these officers to send, in exchange, copies of any locally-produced teaching materials in technical subjects which might be of interest in other Pacific territories.

When territorial officers have inspected the teaching materials collected by the Commission, it should be possible to see which subjects and grades are least adequately served by existing teaching aids.

One of the most serious difficulties in this field will no doubt continue to be the provision of teaching aids for technical training courses conducted in vernacular languages. The Commission can help to some extent here by arranging for an exchange of locally-produced illustrated teaching aids suitable for translation and adaptation.

But the main work of the clearing-house service is concerned with simple books and manuals in English and French, and here the Commission's Literature Bureau will help to follow up the possibilities of having new materials published, if there is found to be a general need in the area for specific types of material.

New publication is, of course, dependent on authors to prepare it: it is hoped that the clearing-house service, as well as being useful to technical training officers by bringing to their notice a number of existing but little-known booklets, filmstrips and posters, will also help to locate officers willing to try their hand at preparing new simple booklets in technical subjects.

QUARTERLY READING LIST No. 17

A Bibliography of Publications relating to Social Development in the South Pacific.

THIS Reading List represents an attempt to note every item to appear in the field of Social Development in the South Pacific during the quarter; the entries are drawn from over 100 periodicals which are regularly examined, as well as from bibliographies, publishers' notices and similar material. Publications of the South Pacific Com-

mission have not been indexed. Items marked with an asterisk have not been seen in the Social Development section. The Executive Officer for Social Development, G.P.O., Box 5254, Sydney, will be glad to obtain for any metropolitan or territorial Government copies of items listed.

SOUTH PACIFIC — GENERAL

Biography

(1) Hommage à Maurice Leenhardt: *Ne Monde non Chrétien*, vol. 33, January-March, 1955. 123 pp. illus.
Special number of the periodical devoted to Dr. Leenhardt and his work. Includes: *Le sociologue* by J. Guiart, *L'ethnologue and l'Océaniste* by J. Poirier, and *Le linguiste* by A. Sauvageot.
(2) Obituary: Camilla Hildegarde Wedgwood. *South Pacific*, vol. 8, no. 6, July, 1956. pp. 110-112.

Linguistics

(3) Languages of Indonesia, Melanesia and Polynesia. *In PERMANENT INTERNATIONAL COMMITTEE OF LINGUISTS.* Linguistic Bibliography for the year 1951 and supplement for previous years. Utrecht, Spectrum, 1953. pp. 263-266. Text in English and French. Includes material on Micronesia.

MELANESIA

Linguistics

(4) DRABBE, P. Een Stalenkaart van taalen. *Tijdschrift Nieuw Guinea*, vol. 16, no. 2, June, 1955. pp. 45-54.

POLYNESIA

Anthropology

(5) GOLDMAN, I. Status rivalry and cultural evolution in Polynesia. *American Anthropologist*, vol. 57, no. 4, August, 1955. pp. 680-697, diag. bibl.
(6) HYE-KERKDAL, K. *Tika*, an old mystery game in the Pacific. *Journal of the Polynesian Society*, vol. 64, no. 2, June, 1955. pp. 197-226, bibl.

AMERICAN SAMOA

Anthropology

(7) EYDE, D. B. A preliminary study of a group of Samoan migrants in Hawaii, Honolulu, University of Hawaii, 1954. 36 pp., processed*.

BRITISH SOLOMON ISLANDS

Education

(8) Education in the British Solomons: An historical review. *South Pacific*, vol. 8, no. 5, June, 1955. pp. 99-104; vol. 8, no. 6, July, 1955. pp. 128 and 130.

COOK ISLANDS

Anthropology

(9) KELLY, L. G. Cook Island origin of the Maori. *Journal of the Polynesian Society*, vol. 64 no. 2, June, 1955. pp. 180-196, diags.

FIJI

Anthropology

(10) GIFFORD, E. W. Roth's "Fijian Way of Life": a review. *American Anthropologist*, vol. 57, no. 4, August, 1955. pp. 893-894.
(11) ROTH, G. K. Housebuilding in Fiji. *Journal of the Royal Anthropological Institute*, vol. 84, pts. I and II, January-December, 1954. pp. 91-102, illus.

Archaeology

(12) FOWLER, H. W. Archaeological fishbones in Fiji. Honolulu, B. P. Bishop Museum, 1955. ii, 51 pp. *Bishop Museum Bulletin*, no 214.

Community development

(13) KEESING, F. M. Hayden's "Moturiki: a pilot project in community development": a review. *American Anthropologist*, vol. 57, no. 5, October, 1955. pp. 1091-1092.

GILBERT AND ELLICE ISLANDS

Anthropology

(14) ROBERTS, R. G. Coral atoll cookery.

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Journal of the Polynesian Society, vol. 64, no. 2, June, 1955. pp. 227-232, illus.

NAURU

Government and Administration

(15) Local government in Nauru. *South Pacific*, vol. 8, no. 4, May, 1955. pp. 76 and 78.

NETHERLANDS NEW GUINEA

Anthropology

(16) BOELEN, K. W. Begrippen "Stam" en "Tuma" (Clan) bij de Ekagi's. *Tijdschrift Nieuw Guinea*, vol. 16, no. 1, May, 1955. pp. 1-6; vol. 16, no. 2, June 1955. pp. 33-38, map.

(17) GALIS, K. W. Papua's van de Humboldt—baai. Bijdrage tot een ethnografie. Proefschrift, 1955. 293 pp., illus., maps*.

Bibliography

(18) Biblografie van Nieuw-Guinea. *Tijdschrift Nieuw-Guinea*, vol. 16, no. 2, June, 1955. pp. 63-64.

PAPUA AND NEW GUINEA

Anthropology

(19) FRASER, D. F. Mundugamon sculpture: comments on the art of a New Guinea tribe. *Man*, vol. 55, no. 29, February, 1955. pp. 16-20, illus.

(20) GROVES, M. Dancing in Poreporena. *Journal of the Royal Anthropological Institute*, vol. 84, pts. I and II, January-December, 1954. pp. 75-90, bibl.

(21) MASSOLA, A. A thief's charm from New Britain. *Mankind*, vol. 5, no. 2, September, 1955. pp. 76-77, illus.

(22) RYAN, D. J. Clan organisation in the Mendi valley, Southern Highlands of Papua-New Guinea. *Oceania*, vol. 26, no. 2, December, 1955. pp. 79-90, maps, diags.

(23) WIRZ, P. Kunstwerke vom Sepik. Basel, Museum fur Volkerkunde, 1954. 24 pp. illus*.

Bibliography

(24) Bibliografie van Nieuw-Guinea. *Tijdschrift Nieuw-Guinea*, vol. 16, no. 2, June, 1955. pp. 63-64.

Co-operation and co-operatives

(25) McCARTHY, J. K. Native co-operative in Papua and New Glinea. *South Pacific*, vol. 8, no. 6, July, 1955. pp. 113-114.

Education

(26) DIETZ, T. Media of instruction in Papua and New Guinea. Port Moresby, Department of Education, 1955. 47 pp. mimeographed. bibl. (*The Problem of Language Paper No.* 2.)

Government and Administration

(27) Local government in New Guinea. *South Pacific*, vol. 8, no. 5, June, 1955. pp. 92-96.

Linguistics

(28) HALL, R. A. Innovations in Melanesian Pidgin (Neo-Melanesian). *Oceania*, vol. 26, No. 2, December, 1955. pp. 91-109.

Medical Services

(29) CALOV, W. L. The medical service of Papua and New Guinea. *Medical Journal of Australia*. 20th August, 1955. pp. 304-310.

TOKELAU ISLANDS

Anthropology

(30) THORNTON, J. Field notes and three legends recorded in the Tokelau Islands. *Journal of the Polynesian Society*, vol. 64, no. 2, June, 1955. pp. 246-248.

TONGA

Anthropology

(31) RAVEN-HART, R. Musical acculturation in Tonga. *Oceania*, vol. 26, no. 2, December, 1955. pp. 110-117.

TRUST TERRITORY OF THE PACIFIC ISLANDS

Anthropology

(32) FISCHER, J. L. Avunculocal residence on Losap. *American Anthropologist*, vol. 57. no. 5, October, 1955. pp. 1025-1032.

(33) LESSA, W. A. Burrows and Spiro "An Atoll culture: ethnography of Ifaluk in the Central Carolines": a review. *American Anthropologist*, vol. 57, no. 5 October, 1955. p. 1090.

(34) SCHNEIDER, D. M. Gladwin and Sarason "Truk: man in paradise": a review. *American Anthropologist*, vol. 57, no. 5, October, 1955. pp. 1098-1101.

PACIFIC READING

No. 12 JANUARY, 1956

This supplement is produced by the South Pacific Commission Literature Bureau; neither the Commission nor individual Administrations necessarily endorse any opinion or recommendation expressed anywhere herein. Every effort is made to check prices where quoted but they should be confirmed with suppliers before orders are placed. Inquiries concerning matters referred to herein should be addressed to the SOUTH PACIFIC COMMISSION LITERATURE BUREAU, BOX 5254, G.P.O., SYDNEY, N.S.W., AUSTRALIA.

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NOTES AND NEWS

Literature Bureau Publications. The book entitled *Wealth from the Coconut* has now been published in its English, French, Melanesian Pidgin, and Malay editions and details of it appear in the Book List elsewhere. It is expected that the other editions in Fijian, Samoan, Maori (Rarotongan), and Tongan will have been published before this issue of the *Quarterly Bulletin* is printed. *The Magic Pot*, which is the first title in the new "Coral Series", has recently been published in Holland by Messrs. J. B. Wolters in association with this Literature Bureau, and details of it also appear in the Book List. *Food and the Work It Does* is expected to be published in November, 1955, by Messrs. Macmillan & Co., at a price of approximately stg.1s.10d. This book has been illustrated with nearly one hundred line drawings; and the simple text is in large, clear print. The author is Miss L. Hamilton, who is Dietician in the Department of Health in Papua and New Guinea. The book is primarily intended for schools and for follow-up work at village level. Another publication expected in the not-too-distant future is *The Rice Book*. It has been mainly designed for Melanesian areas; and the author is Mr. Cottrell-Dormer of the Department of Agriculture, Stock and Fisheries of Papua and New Guinea. It has a very simply written text, and has been profusely illustrated with line drawings by Miss Carol Taylor.

Book Borrowings. In the December, 1954, issue of *Pacific Reading* we printed an analysis of book borrowings by native pupils at the Lorengau Central School, Manus Island. We now give below some figures sent to us by Mr. A. K. Neuendorp, Education Officer to the Unevangelized Fields Mission, Balimo, Papua. These figures are an analysis of the borrowings by the senior boys at a Village Higher School during the past year:

Section.	*Percentage of Books borrowed in this Section.*
Stories	42 %
Hygiene	0 %
General Information (*e.g.*, the Gwen Cross books)	5.4%
Social Organisations	1.5%
Folk Lore	9.5%
Geography and Travel	21.3%
History and Biography	5.4%
Nature Study	9.5%
Science	5.4%

It was noticed that the boys who borrowed largely from the "Stories" section were from the lower half of the classes mainly, and that these lads seldom borrowed from the other groups, with exceptions.

SOME THOUGHTS ABOUT ENGLISH BOOKS FOR THE PACIFIC

by the late CAMILLA WEDGWOOD

This is the third, and final, part of an article covering all aspects of the provision of reading material in English for the islands peoples of the Pacific. Earlier parts of this article appeared in the PACIFIC READING *section of the July and October, 1955, issues of the* QUARTERLY BULLETIN.

Production

A book may be suited to the needs of the islanders in its language, its subject matter and in the way in which the subject matter is presented, and yet fail through its production. When considering production we have to seek a compromise between what would be ideal and what is economically practicable. For a time, until the earning capacity of the Natives and their interest in reading are sufficiently developed for them to be both able and willing to spend an appreciable sum on books, it will probably be necessary for some form of help to be given by administrations or private bodies towards the production of specially-prepared reading matter for the islanders. But whether or not such help is given, it is still important that the cost of producing reading matter should be kept as low as possible so that the Native may be encouraged to buy it for himself. A sound judgment as to what books really meet Native wants and interests can probably be gained only when they have to be bought. A Native will spend money on a book only if it really interests him. It is almost inevitable, therefore, that there should be a conflict between what one would wish to see in the production and the price at which one wishes to be able to sell it.

In determining the kind of paper to be used, the size of the print, the size of the volume, the type of binding and the nature and number of the illustrations, a satisfactory compromise must be sought between quality and cost.

The cheaper kinds of paper are usually rough and porous. Printing is less clear on rough paper than on smooth, and because the difficulties of reading English should be reduced as much as possible, a smooth paper is therefore preferable. In the damp climate of the tropics a porous paper readily absorbs the moisture in the atmosphere and thus, becoming softened, is ill-suited to resist the wear and tear of constant handling by the work-roughened fingers of Native readers. It is easily torn and worn into holes, and quickly becomes begrimed with dirt and perspiration from unwashed hands. Smoother and less porous paper may be equally unsatisfactory by being too thin and transparent. If the print on one side of a page shows through onto the other side, the difficulties of reading are increased, and may be sufficient to prevent a would-be reader from attempting the task.

The size of the print may determine whether a book is read or not. In order to cut down costs of production it is tempting to get as much onto a single page as possible by the use of small type, by setting the lines close together, and by reducing margin space. Even to an English-speaking person, accustomed to reading, a page of close type and narrow margins is a deterrent. To the non-English-speaking islander unaccustomed to reading, it is more than a deterrent, it is a barrier to reading. Clear type, of a size not less than 12 point; short paragraphs of between four and six lines; and lines of not more than eight to ten words are probably satisfactory for readers who are fully literate in their own tongue and who have a fair grasp of English. This may seem extravagant in the use of space, but it is better to reduce costs by a reduction in the number of words than by a reduction in the size of the type. Few people write English in such a way that what they write cannot be reduced to fewer words without loss to the sense, and often with advantage to the sense as well as to the cost of printing. For beginners in English the type needs to be larger, the lines shorter, and each short sentence to stand alone.

The size of a book is significant in relation to its readability and general attractiveness. A length of from 7″ x 7½″, with a width of from 4½″ x 5″, and a thickness of from one-eighth to one-quarter of an inch gives perhaps the most convenient size. A larger and bulkier volume is less easy to handle and needs a more solid and more expensive binding than stiff paper if it is to survive for even a short time. For those to whom reading or reading English is a somewhat laborious undertaking, a more bulky volume has the further disadvantage that they may be daunted or at least discouraged by the number of pages which lie ahead of them. The main disadvantage of books smaller than the size suggested above is that either smaller print has to be used or little more than a couple of sentences can be printed on a single page; the former is undesirable, the latter increases expense. If such books are to be sold, there may be the further disadvantage that the Native may feel that he is being offered too little for his money.

Binding is an item in book production which can be very costly. Most of the books which are now being produced for Native readers have the pages stapled together and are provided with stiff paper covers. The tin staples soon rust in the tropics; the covers easily break away from the body of the book, are easily damaged and do not enable a book to stand upright on a shelf. These are certainly disadvantages. But any other type of binding—the use of brass staples or sewing the sheets together, and the use of board covers—would greatly increase the cost of production. The disadvantages of such an increase would, as things are today, probably outweigh the disadvantages of the tin staples and stiff paper covers. The life of any successful book, constantly thumbed by people who do manual labour, is necessarily short; the pages wear into holes. The cost of a stronger, more lasting binding would therefore be uneconomic.

Illustrations are also a costly item. Are they a luxury which we should dispense with in the interests of economy, or do they serve an important purpose? What are illustrations for?

There are two main reasons for putting illustrations in a book: to excite the interest of a potential or actual reader; and to explain or amplify what is written in the text. In the quotation already given from *Alice in Wonderland*, pictures as well as conversation are deemed essential if a book is to be interesting. Most people on opening a book look to see whether it is illustrated, and, if it is, most of them turn to the illustrations even before they glance through the chapter headings. Good illustrations always add to the attractiveness

of any book. For this reason alone good illustrations are important in books for island readers. They entice the novice to begin reading and lure him on to continued effort by exciting his curiosity. "Why is the man running away?" "Who are those people hiding in the cave?" "Will that ship be sunk in the storm?" There is pleasure, too, in identifying what one is reading with what is portrayed. "That is little boy blue; there he is fast asleep; there's his horn on the ground beside him; and there are the sheep getting into the corn-field." Thus, particularly for one to whom reading in English does not come easily, illustrations serve as a very valuable stimulus to reading. An illustration can summarise what has been recounted over two or three pages, and can incite him to think about it. Really good illustrations can do more: they can stimulate his imagination.

In books intended primarily for recreational reading or for giving a better knowledge of the English language and culture, most of the illustrations (though not all of them) are intended primarily to arouse and maintain interest; that they also help to explain the text is of secondary importance. In books dealing with scientific or technical subjects the illustrations are intended to illustrate the text, to express concisely in pictorial form what is expressed in greater length in words, or to amplify the words: words and illustrations are, indeed, complementary. That the illustrations may also arouse interest and serve as an enticement is incidental. Illustrations whose purpose is primarily to arouse and maintain interest we may term "pictorial"; those intended primarily to interpret or be complementary to the text we may term "didactic". In reading matter designed for propaganda the illustrations need to be equally pictorial and didactic. All too often they fail "pictorially".

A common type of didactic illustration is the diagram. The best diagram is that which does not attempt to tell too much. Where one diagram is used to illustrate two or three points, the result is liable to be a confusion of lines. Diagrams reproduced on a small scale are also unsatisfactory. To sacrifice clarity for lower production costs is a false economy. This is true also of didactic illustrations which are not diagrammatic, both drawings and photographs. Too often the artist tries to tell too much in his drawing, or the central idea of his illustration is obscured by irrelevances put in for pictorial effect. Sometimes a didactic drawing which would serve its purpose well enough if allowed to occupy a full page is made almost useless by being reproduced on too small a scale. Photographs are not suitable for didactic illustrations, unless they have been taken by an expert to serve this specific purpose. Even then they do not reproduce well on the quality of paper which is commonly used for inexpensive books. How far pictorial symbols such as "stick men" and those used in iso-type productions are successful in didactic illustrations for non-European readers there is little evidence to show. "Stick men" have been successfully used in the early stages of teaching English to island Natives. In their own carvings and paintings the islanders show little interest in "representational art", and it may well be therefore that they find these symbolic representations of things and activities easy to apprehend. The symbols certainly have the virtue of being free from confusing irrelevancies.

The first duty of "pictorial" illustrations is to hold the eye and challenge the attention. Drawings achieve this better than photographs, especially when these can be reproduced only on cheap paper. Colour adds to the efficacy of pictorial illustrations if used with discrimination; but striking effects through the use of contrast can be achieved in black and white. Probably no one illustrating technique is intrinsically better than another for island reading material, except in so far as some are less expensive than others, and some reproduce better on cheap paper. Outlines should be bold; fine detail should be eschewed; and the pictures should be full of movement—trees bending in a gale, men and animals running and leaping—or, if static, should relate to a point of time in a dynamic story. Because people are generally more interested in persons than in scenes, pictures of people (or of personalized animals) generally arouse more interest and curiosity than pictures of places, and are therefore more satisfactory for pictorial illustrations.

Accuracy of representation is necessary in most kinds of didactic illustration. Is it necessary in pictorial illustrations? Photographic accuracy can safely be ignored, but cultural accuracy is essential. For the figures and objects in a picture to be shown not in correct proportion matters little; but for a man to be shown carrying something on his head, or for a woman to be shown walking in front of her husband would make an illustration ridiculous—and might well call forth some obscene remark. Further, a pictorial illustration should be accurate in its correlation with the text. Children often object to an illustration if it includes something not mentioned in the text; both children and adults often resent an illustration which contradicts the text, even if only in some detail.

Laughter is a great aid to learning, and humour in illustrations (both didactic and pictorial) can be very helpful in encouraging reading and in helping the reader to remember what he has read. Unfortunately, as mentioned earlier, the conception of what is funny varies greatly from one culture to another. Illustrations which are intended to be humorous (whether in their style of drawing or in the situations which they depict) may be appreciated as amusing, but they may prove merely puzzling, or even be conceived as tragic, by readers of another culture.

In a book whose pages measure 5″ x 7½″ or less a pictorial illustration needs a full page. It is better to have a few full-page illustrations than a larger number of smaller ones. The only exception to this general principle is the tail-piece, which is by intention decorative, not pictorial. If, however, an illustration has to share a page with the text, it should not be set in the midst of the text. It can be very disconcerting to the novice in reading, or to the novice in reading English, if the rhythm of his eye movements, and the train of ideas in what he is reading are interrupted by a picture. Such an interruption is particularly undesirable when, as often happens, it occurs in the midst of a sentence.

At present, book-hunger in the Pacific Islands is very keen. Those who can read English are ready to read almost anything they can lay their hands on which is at all within their comprehension, be the text and the production good, bad or indifferent. This fact does not exonerate us from the responsibility of providing them with reading material whose text and production are both good rather than bad or indifferent, even if we cannot afford to make them excellent. The quality of the books which we provide depends less upon the amount of money which can be expended upon them than is often supposed. It depends very largely upon the intelligence and imagination of those who write and produce them, and upon a growing refusal among those who are concerned with the intellectual development of the islanders to accept the second-rate as "good enough".

Contributions Invited for *Pacific Reading*

The problem of discerning and meeting the reading needs of the island people is a many-sided one, and we feel that an exchange of views and experiences through the pages of *Pacific Reading* would be of value to all. We should be glad to consider articles of from 750 - 3,000 words; and we should also welcome shorter letters containing news and personal views and experiences from which we may publish extracts. We should be interested to hear about experiences with individual books; indications of apparent likes and dislikes of the reading public; experiments (successful or otherwise) in the distribution and sales of literature; experiences with island libraries; and we should especially like to have reports of the views of island readers themselves.

BOOK LIST No. 12

Items reviewed have been chosen for their general interest or for their relevance to educational and development problems in the South Pacific area. Wherever possible the price stated is the published price in the country of origin.

ENGLISH COURSES

BETTER YOUR ENGLISH. E. A. L. Gaskin. London: University of London Press; stg.1s.6d. 1949. pp.64.

This little book does not pretend to give a formal or exhaustive treatment of English grammar. It has, in fact, grown out of a series of broadcast talks given by the author for the benefit of African students, because they had found certain common difficulties in their attempts to master the English language. The original broadcast talks proved popular and were published in one of the West African newspapers; later, at the request of readers, they were produced in the form of this book. Many of the important pitfalls into which the unwary stumble are discussed in these talks: the use of verbs, tenses, and prepositions; common errors; and common idioms; form a large part of the contents. This should prove a useful little book for islanders and will serve to remind them of a few important rules which they must learn if they wish to speak and write good English. It has been recommended by the East African Literature Bureau for use in African Secondary Schools.

THE MAGIC POT. Peter Livingston. Groningen: J. B. Wolters'; D.fl.0.65 (i.e., approximately stg.1s.3d.). pp. 21. 1955. Illust. (*Coral Series*) (*South Pacific Commission Literature Bureau publication*)

This attractively produced little book is the first in the new "Coral Series". It is a traditional tale from the Port Moresby district of Papua; and the author has spent a considerable number of years in the Territory. It has been written in simple English and should prove suitable as a supplementary reader in schools, or for adults, at about 4th-6th year level of English. There are five two-colour illustrations, and a two-colour cover page. The text is printed in large clear type on good quality paper. Educationists and booksellers interested in obtaining inspection copies of this book should address their inquiries to the Literature Bureau, Box 5254, G.P.O., Sydney, N.S.W., Australia. It is hoped that further titles will be produced from time to time in the "Coral Series", which will be for legends, fiction, and folk tales with an authentic Pacific background. The Literature Bureau will welcome manuscripts and suggestions for possible inclusion in this series.

AESOP'S FABLES. Edited by M. Graham Brash. Calcutta: Macmillans; 10 annas. 1948. pp.viii-72. Illust.

The fables in this book have been selected and adapted keeping in mind the needs of schools in India. They are, however, simply told and will probably be appreciated and understood elsewhere. There are forty-four fables, and each is followed by suggestions for written exercises and conversation. Some are in verse, and will perhaps prove useful in assisting teachers to teach rhythm and accentation. Others would lend themselves to dramatisation by the pupils, and this might greatly assist in the object for which this book has been prepared: to assist a real power of expression and command of language. 4th-6th year of English standard.

GENERAL READING

BRAVE CHILDREN OF OTHER LANDS. E. F. Dodd. London: Macmillan & Co. Ltd. Stg.10d. 1954. pp.48. Illust.

The short stories in this book have received very careful attention from the author to make them suited to overseas readers. The vocabulary is a carefully chosen one of about six hundred words, and the sentence structures are all very simple. These stories come from many countries, but the author has been careful not to introduce too much 'foreign' background, which would be difficult for island readers to understand. Most of the stories are traditional (e.g. "Hans and the Dyke"); some are typical of the countries in which they occur; and one, "Helen Keller", is true. These stories teach a valuable lesson of courage and self-sacrifice; and are suitable for either school or adult reading at about 3rd or 4th year level of English.

LETTERS TO A YOUNG TEACHER. A. V. P. Elliott. London: Longmans, Green; stg.1s.6d. 1951. pp.66. (*Lantern Library*)

The author of this book was at one time associated with Makerere College in Uganda. He has a great understanding of the Africans, to whom this book was originally addressed. The book is free from dogmatism, and is full of sound advice; and has been written with a wealth of experience, sympathy, and understanding.

"Peter", to whom the letters in this book are addressed, is a composite personality built up from the students the author taught in Africa. The letters start from the time when Peter—then in the sixth form—decides to become a teacher, and continue through his teacher-training college years and conclude soon after he has commenced teaching. Advice, encouragement, and thoughtful explanations of the problems with which Peter is confronted, are offered in each letter. The approach to the subject is fundamental and universal, and makes this book of potential value and appeal in all areas.

THE HIDDEN VILLAGE. Keora Kone and Dorothy Mulgrave. New York: Longmans, Green; $2.50. 1954. pp.111. Illust.

Well-written, interesting, and entertaining folklore of the Pacific designed to be read by all ages is indeed scarce, and this fact alone will make *The Hidden Village* warmly welcomed in the Pacific. How rich the Pacific must be in suitable material for the folklorists! Yet, little has been done to provide attractive and interesting material for this area. The authors point out that the legend of the Menehune or "little people" is one of the most widespread in the Pacific; in spite of variations in their physical characteristics, in the powers attributed to them, and in the spelling of their name, the relationship between them and the islanders remains the same. This story has been based on the lore of the Menehune in the Hawaiian islands, but will undoubtedly be read and enjoyed all over the Pacific. In addition to its other merits the book has a good moral: the Menehune are philanthropic and diligent little people and the example they set cannot be regarded as anything but good. The story is of an island boy who becomes a hero in a time of crisis of his people; in this he is largely assisted by the Menehune whose help he enlists. The book has been well illustrated and fairly simply written. Sixth year of English.

AGRICULTURE

WATER AND THE LAND. J. B. Clements and P. Topham. London: Oxford University Press; stg.1s. 1940. pp.VI + 58. Illust. (*African Welfare*)

The authors of this book have worked in Nyasaland for many years and have much experience of forest conservation

and soil erosion. In Nyasaland, as in some areas of the Pacific, the land is the sole economic asset of the people. The preservation of soil fertility is an urgent problem and one which can only be solved by long-range programmes of land usage and by the education of every man and woman who works on the land. The writer of the foreword to this book states that: "*Water and the Land* should prove invaluable for all those who are educating Africans (and, indeed, rural populations of other continents) to maintain and improve the fertility of the earth. In simple and effective ways it demonstrates how close is the relationship between water and the land; and it is as interesting as it is instructive." It is interesting to compare this extract from the foreword with an earlier report we received from Professor Schindler in New Guinea, he said: '. . . the best of all I have come across for rural education is one entitled *Water and the Land*. But for the fact that conditions in Africa are not those prevailing around us, so that, now and then, what happens to be true there is false here, I would make it the axle around which the whole course would revolve.'

This book has been very carefully prepared and the authors have taken great care to make it as interesting as possible and at the same time really instructive. It deals, in some detail, with the most essential matters and at the same time does not pause so long as to bore. Having read this book, one is left with a clear and lasting impression of the causes of soil erosion and the necessary measures for its prevention. Although the conditions it outlines may not appertain to all parts of the Pacific, there will be undoubted use for the book. It is sufficiently simply written to be readily understood by fifth or sixth year students of English.

WEALTH FROM THE COCONUT. W. V. D. Pieris. Sydney: Ure Smith Pty. Ltd.; stg.2s.6d. 1955. pp.39. Illust. (*South Pacific Commission Literature Bureau publication*)

The author of this book is a world-wide authority on the coconut palm, and he has had extensive experience in Ceylon and at Kew in London. For several years, in his capacity of Technical Officer on the staff of the South Pacific Commission, he specialized in the coconut cultivation problems of the Pacific, and travelled throughout many parts of the area examining problems and conditions. It was felt that one of the most valuable ways of assisting the improvement of existing coconut plantations in the Pacific would be to advise the islands peoples themselves of the steps they should take to improve the quality and yield of their palms; and this book is the result. It has been attractively produced in clear type on good paper and has thirty-three two-colour illustrations as well as a two-colour cover. The text is simply written; and the steps described for rehabilitation and improvement of existing plantations include: "Selection of Mother Palms"; "Selection of Seed Nuts"; "Coconut Nurseries"; "Selection of Seedlings"; "Planting Distance and Preparation of Seedling Holes"; and the "Transplantation and Care of Transplanted Seedlings". Although intended mainly for the islands peoples, this book may prove of value to all who cultivate the coconut palm. In addition to the English edition, seven other editions are being published in French, Melanesian Pidgin, Malay, Fijian, Samoan, Maori (Rarotongan), and Tongan.

LIBRARIANSHIP

A SHORT GUIDE TO LIBRARY MANAGEMENT. E. S. Fegan. London: Sheldon Press; stg.2s.0d. 1941. pp.40.

For those in tropical countries, with limited funds for purchase of books, who are responsible for running a library and who wish it to be run efficiently on orthodox lines, this small book will perhaps prove useful. The author notes some practical suggestions for overcoming some of the difficulties that are likely to be met in the initial stages of setting up a library. He explains how shelving can be made and what to do and what not to do with the furniture and equip-

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ment. For instance, he points out that it is inadvisable to paint the *inside* of shelves (unless water paint is used), as this causes books to constantly stick to the shelves. He deals with the treatment of books to prevent damage by insects, and discusses the advisability of making the various treatments to covers and spines of books. The more formal aspects of librarians' work, including cataloguing and classification, are dealt with at sufficient length to enable the beginner to grasp some understanding of them. As Mr. Fegan states, it is necessary, for reasons of space, to be dogmatic in a short book; but this is probably all to the good, as many librarians in the islands are only carrying out the duties in their spare time, and this will perhaps meet their immediate needs for a simple book on the subject. For those who wish to study the subject further a short bibliography is included.

DOMESTIC WELFARE

COOKING FOR THE FAMILY IN EAST AFRICA. Esther Koeune. Nairobi: Eagle Press; East African shgs. 3. 1953. pp.91. Illust.

This book does not pretend to give a comprehensive treatment of household management for tropical areas; but it does cover a good deal of ground. Its starting point is a description of ideal designs for African kitchens, and it then goes on to discuss essential cooking equipment. Throughout it keeps in mind the question of limited incomes, and the necessity for improvisation. It illustrates suitable kitchen implements, including large knives, forks, soup ladles, egg whisks, etc., which can be made from wood; strainers, grain shovels, baking tins, fish slicers, are also illustrated and some brief details are given as to how these may be made from easily obtainable materials at no cost at all. Having dealt with these basic requirements, the book goes on to describe methods of preservation and storage of food, methods of cooking, and planning meals. The remaining sixty-two pages contain simple recipes, many of which will be found practicable for the Pacific islands. Although fairly simply written, this book is primarily intended for native teachers who have to teach cooking in schools.

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COMMERCE

BOOKSELLING. Thomas Joy. London: Pitman; stg.15s. 1952. pp.159.

The author of this book has had twenty-five years bookselling experience divided between a university bookshop, and management of bookselling departments in two of London's leading stores. Much of what he has written, good as it is, will not be applicable in the islands. There is, however, a great deal of interesting information in this book that will be found useful by island booksellers. Those who wish to acquire a knowledge of the ways of the book trade, and publishers and booksellers' jargon, will find this book of great assistance. The numerous appendices are extremely useful and cover most of the information that is essential for a bookseller to acquire.

Bookselling in isolated areas, such as the Pacific, is indeed more difficult than in other places. In nearly all large centres of population, in most countries, publishers' representatives are in personal contact with booksellers and are thus able to assist them with their requirements, and to keep them advised of new books being published. In areas such as the Pacific, the booksellers are forced to rely on printed publicity material they receive from publishers, and on reference books, to assist them in ordering the books they require. It is obvious that to order a book which is shown by a publisher's representative and which the bookseller can examine, is far simpler and infinitely preferable to ordering the same book merely from a description of it in a publisher's catalogue. But this position must be accepted, and catalogues, booksellers' periodicals, and reference books are of great importance for the booksellers isolated from publishers. The very full list of publications of interest to booksellers that appears in this book, make it of great importance to the island bookseller.

Books on bookselling are no more likely to produce competent and successful booksellers, than books on art are likely to produce talented artists. On the other hand, there is little doubt that those who are interested in art or bookselling will gain some information from books on these subjects. To be a successful bookseller is something which probably requires a flair, and definitely requires hard work and exacting methods. However—as Mr. Joy says—it is difficult to state exactly the qualities which go to making a successful bookseller.

Those who wish to establish bookselling in the islands or who are already engaged in the trade will no doubt require this book among the tools of their trade—reference books.

SCIENCE

THE DIESEL ENGINE. Kenneth Hunt. London: Cassell & Co. Ltd.; stg.2s.6d. 1954. pp.32. Illust. (*How It Works*)

We have received several inquiries from the islands for simple books on the diesel engine. This book is the simplest we have so far seen on this subject, although even it will not be simple enough for any but the more advanced islander. It clearly explains the general principles of the diesel engine with the assistance of diagrams and drawings. In a book of this size it is obviously not possible to give exhaustive details of any particular type of diesel engine, and it confines itself mainly to basic principles and to a brief examination of the various types of diesel engine and their purposes. An examination of recent discoveries and advances in the use

of diesel engines and an indication of possible future trends is made. One of the most important points in this book is the use of the 'Techni-View' method of illustration. This method does, as the publishers describe it, "take you right inside the engine and show you every working part in detail". The 'Techni-View' illustrations are printed on transparent paper, and at the first glance the outside of one side of the engine is seen; when the page is turned it is possible to see the whole of the inside of the engine divided into two parts, one on the right and the other on the left hand page; on turning the next leaf the whole engine is seen from the reverse side. Small numbers in the illustration give easy reference to the names of each part. This method of illustration is a great advance and will considerably assist in any manuals designed for maintenance work on engines. It is already being used by the Shell Co. in their tractor maintenance books. Other titles in the 'How It Works' series are *The Petrol Engine*, *The Steam Engine*, and *The Jet Engine*.

MANUAL ARTS

CARPENTRY DICTIONARY—JOINTS & CARPENTRY HANDBOOK. Joy Rhodes. Utah, U.S.A.: Materials Preparation Department, Intermountain Indian School, Brigham City, Utah; $0.20 each. 1953. pp.33 & 32. Illust.

These two books have been produced by the multilith process and this probably accounts for their fairly low price. They have both been clearly illustrated with diagrams. *Carpentry Dictionary—Joints* is the second of two volumes (the first is a *Dictionary of Tools and Machines*) both of which deal with Mill Work and Cabinet Making for boys who wish to adopt these as their vocation. In all, twenty-four different types of joints have been dealt with, and, although it is probable that the students will not encounter more than half of these in their shop-work, it is perhaps useful to have them for reference purposes. An entire page has been used for each joint and about half of the page is taken up by the diagram illustrating the joint, and beneath the illustration appears its name, the manner in which it is made, and the uses to which it is most commonly put. Difficult words and their explanations are listed at the end of the book. This book should be found useful as a recognition manual and could assist the student's memory, or act as a supplement to any course of instruction in carpentry. *Carpentry Handbook*, while more limited in its applicability to Pacific conditions, may also be found useful. It has been written with the student in American Indian schools in mind, and therefore the conditions which it outlines will, in certain respects, be found not to apply in the Pacific; for instance, its references to the wages that might be expected for a carpenter, apprenticeship, and workmen's compensation regulations are written within the framework of American conditions. It does not set out to teach carpentry, but to outline some of the things that the would-be carpenter can expect from it, and some of the things that he must be capable of and prepared to do if he is to adopt it as his trade. Most of what it has to say is sound common sense and bears frequent repetition; the vocabulary and sentence structure are extremely simple and any difficult words are explained.

HAND TOOLS. Navy Training Course. Washington: U.S. Government Printing Office; A.6s. 1951. pp.153. Illust.

Originally produced for the use of U.S. enlisted personnel, this useful little book contains a wealth of information on the correct use and care of a wide variety of tools and should prove a boon to many island tradesmen and others who have to use tools. Sound advice is given firstly on the handling and care of such general purpose tools as hammers, screwdrivers, pliers, wrenches and punches. This is followed by explanations of how to use the shaping and cutting tools, such as chisels, hacksaws, files and hand snips. Other more

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advanced topics covered include tools for soldering, drilling, reaming, thread cutting, measuring instruments and the use of abrasives. The text is easy to read, being simply and clearly written, with plenty of excellent line drawings.

SOCIAL STUDIES

AN EAST AFRICAN CHIEF IN ENGLAND. Antonio Opwa. Nairobi: Eagle Press; East African shgs. 1.50. 1952. pp.38. Illust.

This is an interesting booklet not only in itself but also as an example of something which could be done, and would probably prove very popular, for the Pacific. Antonio Opwa, the Uganda Chief, who has written this book, has dealt with the subject with understanding and simplicity. What he saw and approved—he has praised; and what he saw and disliked—he has dealt with tolerantly. How desirable it would be if all authors of all races and colours were equally tolerant! Although his stay in Great Britain was only of six weeks, he managed to see much in that time, and his powers of observation, quick intelligence, and ability to assess, have made this an interesting book which must have been welcomed in Africa. The reason behind his visit, with three other Uganda chiefs, was to enable them to report to their peoples about their experiences; as it was recognized by the British authorities that information at first hand from their own chiefs would be more readily believed and digested than coming from the mouths of British people. It would have been easy for the author to have dealt at great length with points which usually impress visitors to England, and to have produced something which was little more than a typical travel book; but from this he has refrained, and he has dealt largely with important things such as the cultural background, libraries, courts, village councils and other aspects of the British way of life which, in some cases, he compares with similar institutions in Uganda.

CHARACTER—ITS PSYCHOLOGY. V. L. Griffiths. London: Longmans, Green & Co.; stg.3s.3d. 1953. pp.97. (*Good Citizen Series*)

This book is a companion volume to *Character Training* and *Character Aims* previously reviewed in *Pacific Reading* No. 2, March, 1953. The books are the outcome of a series of experiments carried out in the Sudan into the basic qualities of character required by young citizens in a newly formed self-governing community. In this present volume—essentially an elementary introduction to character psychology—the author discusses various aspects of character building, based on his own experiences, and views held by present-day psychologists, and some common causes of character weakness. As to the value of a psychological approach, the author says: "Some understanding of the views and attitudes of psychologists, as distinct from a detailed technical study of their methods, can be a great help in one's own life and a help in the bringing up of children. . . . For teachers and parents its main value is that it gets them thinking of children's growth in a more understanding way and therefore they are more able to deal with children's difficulties."

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CHOCOLATE AND COCOA. Henry Compton. London: Educational Supply Association; stg. 4s.6d. 1952. pp.64. Illust. (*How Things Are Obtained Series*)

A simple explanation in non-technical language of how cocoa and chocolate are made. The book describes mainly the growing, harvesting and marketing of cocoa beans and sugar—two essential raw ingredients—and how these products are handled and blended at the factory to make either cocoa or a wide variety of chocolates. The latter part of the book gives a brief description of such things as: the discovery of cocoa beans, growth of the industry, keeping the factory working, and export trade. It has been well illustrated with many excellent photographs. Other titles in the series include: *Glass, Tea, Wool* and *Iron and Steel.* Secondary schools.

THE STORY OF THE KITCHEN. S. E. Ellacott. London: Methuen & Co.; stg.8s.6d. 1953. pp.76. Illust. (*Methuen Outline Series*)

You may be surprised to know that the modern pressure cooker, commonplace in many present-day homes, was actually invented during the 17th century. This and other interesting highlights are to be found in this very readable account of the history of the kitchen and cooking methods. Tracing the development of British cooking methods from the stone age to present times, it describes the different types of food and drinks available in each period, how they were used and the changes brought about by the influence of technical inventions, new sources of food, social changes, and increasing knowledge of dietetics. The text is well illustrated with clear line drawings—there is at least one on nearly every page. Primarily intended for English children of 10 to 15 years of age, it may prove useful in girls' secondary schools in the islands.

REFERENCE BOOKS

COMMON ENGLISH PROVERBS. A. Johnson. London: Longmans, Green & Co.; A.6s.6d. 1954. pp.122.

Well-produced and attractively printed, this book contains a collection of 500 commonly used proverbs classified under the headings of: "Words of Wisdom"; "Behaviour"; "Advice"; "Husbands and Wives, Children and Friends"; "The House"; "Animals, Birds and Other Creatures"; "Wealth"; "The

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Weather"; and "Death". A brief explanation of the literal and applied meanings as well as the common usage is given after each proverb; a simple system of single and double asterisks clearly indicates whether a proverb is well known or very well known. The book should prove very useful either as a reference book for the school library or for general reading by those with a fair knowledge of English.

FLAGS. 50 YEARS OF AVIATION. MERCHANT SHIPS. Alkmaar: Arti-Alkmaar-Holland; D.fl.1.65 each. 1951-1953. pp. 62-73. Illust. (*Picture Encyclopedia*)

These are three titles in a series of ten, the others are: *Costume, Calligraphy, Jet Aircraft, Man, Paris, Mammals,* and *Lettering.* Each book has been attractively produced on high quality paper and well illustrated—some of them in colour. They are firmly bound with thick board covers which have coloured illustrations and a varnish finish. Each book contains four separate texts in Dutch, French, English and German. Taking all these things into account, the price of D.fl.1.65 (i.e., approximately sterling 3s.3d.) seems very reasonable. Although the text is not in all cases as simple as is desirable for island readers, there are several titles in the series which will prove useful as recognition manuals. *Flags,* for instance, gives the national flags of 108 countries; and, where they exist, the merchant shipping and flags of war. To facilitate reference, the book is divided into sections covering the continents; and an outline map of each continent is divided into countries, each of which is numbered with the number referring to the place in the text where the coloured illustrations of the flags of that country may be discovered. *50 Years of Aviation* is illustrated with over eighty good black and white photographs. It too is divided into sections; one covering the period from 1903 (and the Wright brothers' history-making first powered flight) to 1940; the second covering the extraordinary progress made in aviation from 1940-45; and the final section dealing with the equally astonishing progress made since the advent of the jet engine. Civil and military aircraft from several countries are included. *Merchant Ships* is illustrated with coloured drawings; it gives ships representative of many periods from a number of countries. Although its contents are very interesting, the method of recording the information about each ship is not simple to follow, and constant reference has to be made to the index of abbreviations. This interesting, inexpensive, and well-produced series will perhaps prove useful in libraries everywhere.

Territorial Publications

From time to time copies of various island publications in the language of the metropolitan countries are received in the Literature Bureau; some of these are sent by territorial governments and some by non-official bodies. Some are designed for the use of island educationists, and others are intended for the island peoples themselves.

As it is known that there is a desire in many places to keep in touch with progress that is being made in the provision of literature in other territories, it has been decided to publish a few details of some of them from time to time. Some of these publications are not available for general sale, but it is possible that arrangements could be made for either inspection copies to be sent to anyone who is interested in receiving them, or for copies to be made available on an exchange basis. The Literature Bureau would be glad to assist anyone interested in this matter by making the necessary inquiries.

Publications received include territorial newspapers and periodicals, school journals, occasional publications, and school textbooks and general readers. It is hoped to include short reviews of some of these in future "Book Lists" in *Pacific Reading,* and we should welcome receiving further similar publications for mention in these columns.

VISUAL AIDS

Films in the Commission library are marked with an asterisk before the title, and are available for viewing by any metropolitan or territorial government on application to the Executive Officer for Social Development, Box 5254, G.P.O., Sydney, N.S.W., Australia. Age classifications, where given, are intended as a guide rather than a recommendation.

*CHALLENGE TO IGNORANCE. 16 mm. 9 min. Black and white. Sound. Produced by Colonial Film Unit. Price £stg.2/15/-.

The subtitle of this film is *A Report on Demonstration Teams in Uganda,* and it shows something of the work done by such teams in educating village people in child welfare, nutrition, soil conservation, banana growing, road safety and so on. The lessons are taught by actual demonstration, assisted by plays and dramatised incidents designed to entertain and amuse the audience. The rapt attention of the people watching these performances gives an indication of the success of the methods used and the value of personal demonstration on the spot is, of course, too well known to need discussion here. An interesting and instructive film which may prove a useful source of ideas for people engaged in practical work of this kind.

*CLEAN MILK. 16 mm. 10 min. Black and white. Silent. Colonial Film Unit. Price £stg.3/6/-.

The moral of this film is that good milk pays well, bad milk pays little, and ways of improving the quality of milk are demonstrated—the importance of clean utensils, preparations for milking, washing the cow and its udder, washing the hands, the proper way to milk a cow and, after milking, the thorough cleaning and sterilizing of all utensils used. Subtitles in an African language will, of course, be out of place in the Pacific, but with a commentator the film should be found useful.

*COCOA REHABILITATION. 16 mm. Approx. 10 min. Black and white. Sound. Colonial Film Unit. Price £stg.8.

Worried by the deterioration of cocoa growing in the West Indies, the Government offered assistance to farmers genuinely interested in cultivating this important crop. The help offered included expert technical advice and subsidies towards the establishment of plantations. The two stock figures of Mr. Wise and Mr. Foolish are seen here as West Indian farmers, one of whom thinks he does not need advice and the other who goes to the Agriculture Department and takes advantage of all the help they can give him. While Mr. Foolish is struggling along with his old-fashioned methods, Mr. Wise has taken over a derelict plantation, cleared and replanted it and finally sold his harvest for a gratifying sum. Mr. Foolish, turning up with his few bags of beans, realises how silly he has been.

*COFFEE REGENERATION. 16 mm. 10 min. Black and white. Silent. Colonial Film Unit. Price £stg.4/2/-.

The present writer found this film rather meaningless, for not only has it no commentary but such captions as it has are in an African language. The whole thing moves at snail's pace and badly needs a running explanation. The subject is how to improve the quality and yield of coffee plants by regular care and inspection and such measures as pruning and tying down branches. The film would be useless without a good and well-informed commentator.

FARMER CO-OPERATION IN EUROPE. 16 mm. 30 min. Black and white. Sound. World Wide Pictures, London. Price approx. $45.

This film deals with the advanced development of several European co-operatives, with special emphasis on machine processing and the use of scientific methods. Dairying, egg and fruit packing and marketing, vine products, weaving, farm spraying, etc., are shown. Should be interesting to communities in developed countries, and, though perhaps not entirely applicable to the Pacific Islands, native co-operative societies should find the subject of interest.

GASPE COD FISHERMEN. 16 mm. 12 min. Black and white. Sound. National Film Board of Canada. Price approx. $30.

Short and interesting, the film tells the story of the fishermen in Gaspé, Quebec, who found that co-operative business could give them a very good return and a secure position in the fish markets. Details are given of the actual fishing, cleaning and packing of fish. Although it would have helped if more details were shown of the first coming together of the fishermen to form the society, and of their previous

hardships, the film is not difficult to understand. The Commission intends to secure a copy for its library.

*MARANGU. 16 mm. 20 min. Black and white. Sound. Produced by Colonial Film Unit. Price £stg.4.

Marangu is a chiefdom near Mt. Kilimanjaro, where an enlightened and progressive chief has brought prosperity and happiness to his people. Traditional arts and crafts such as wood carving are encouraged and attention to the community's material welfare takes the form of supervision in such things as irrigation, soil conservation, market prices, ploughing and cultivation, the grading of skins and hides and help in the production of coffee. The well-dressed and well-fed people and their flourishing market and school are evidence of their prosperity and their contented expressions would indicate that they are aware of their good fortune.

PEOPLE WITH A PURPOSE. 16 mm. 25 min. Black and white. Sound. National Film Board, Canada. Price $75 (also available in colour, $187.50).

An account of the progress of co-operative farming and marketing in Manitoba, Canada, which shows the impressive up-to-date co-operative organization that the 45,000 farmer-members have built up. Their achievements include grain silos, shipping services, cheese and butter factories, and combined services for the supply of fuel oil and coal. This film includes a short glimpse of summer school activities, and a fairly good one of radio adult group studies. Credit union transactions are also shown. Though less advanced than *Farmer Co-operation in Europe*, this film is nevertheless presented in an idiom that may be a little removed from the experiences of Pacific peoples.

*PIG FARMING. 16 mm. 30 min. Sound. Produced by Colonial Film Unit. Price £stg.9.

This is a story of a young man who took up pig farming and made a success of it. Before starting he took a course in pig farming at an agricultural training school and learnt modern methods of housing and caring for the animals. Returning home, he builds new sties and, when all is ready, goes to buy his imported pigs from the training farm. His knowledge of correct feeding and hygienic housing conditions now proves its value and at the end of the film he is seen receiving a handsome price at the market for his young pigs. Though emphasising that pig farming brings only modest returns and means hard work, it is clear from the film that it is a rewarding occupation.

Filmstrips

CHERISH THE HAND THAT FEEDS US. Produced by the International Union for the Protection of Nature, Brussels. Black and white. 49 frames. No captions. Printed commentary. Published price apply.

Subject: Man's dependence on Nature.
Medium: Photographs, engravings, drawings, diagrams.
Technical Standard: Varied—from below to above average.
Comment: A long, leisurely and at times artistic filmstrip which has been produced with the assistance of UNESCO, and which discourses on the relationship of man to his natural environment—his dependence on it and the uses he has made of it, the dangers of thoughtless exploitation of resources and the ways we can avoid incurring these dangers. The illustrations range from photographs of scenery and animals to reproductions of paintings, and drawings of different kinds. The strip is made in double frame and all pictures are horizontal. . . . . General.

NATIVES OF AUSTRALASIA AND THE PACIFIC. Produced by Common Ground Ltd., London. Black and white. 36 frames. No captions. Teaching notes. Published price stg.16s.6d.

Subject: Native peoples.
Medium: Photographs, maps.
Technical Standard: Good.
Comment: The peoples shown in this filmstrip are the Aborigines of Australia, the Dyaks of Borneo and the Fiji Islanders. The first section shows briefly the physical appearance of the aborigine, man, woman and child, the type of country in which they live, their ways of collecting and cooking food, their art, in painting and dancing. Naturally no great detail can be included in a limited number of frames, and this also applies in the other two sections, but in general an adequate impression of the subject is achieved. The second section shows the Dyaks and their houses, planting and harvesting rice, cooking, weaving and making canoes; and the last one deals with life in Fiji, and the daily activities of Fijians. . . . 10 + ages.

NIEUW-GUINEA, EEN LAND IN OPBOUW. Pts. I & II. Produced by Central Projectie Instituut, Amsterdam. Price, Pts. I & II, 5 florin (approx. A.12s.).

Two very long filmstrips about Netherlands New Guinea, composed of very good photographs and accompanied by printed notes, in Dutch. English translations can be made available to borrowers of South Pacific Commission copies.

(i) LAND EN VOLK. Black and white. 49 frames. Captions in Dutch. Printed commentary.

Subject: The people and country of Netherlands New Guinea.
Medium: Photographs, 3 maps.
Technical Standard: Good.
Comment: Some of the photographs are very good and show the people and their occupations, arts, houses and life generally. Others show the landscape, vegetation, and fauna. The quality of the pictures varies but is good on the whole. Double frame has been used, which means that the strip must be projected sideways. A disadvantage is the occurrence of several vertical frames among the horizontal, which involves turning the projector-head during screening. Each picture has a short caption under it, in Dutch.

(ii) MIDDELEN VAN BESTAAN. Black and white. 45 frames. Captions in Dutch. Printed commentary.

Subject: Means of subsistence.
Medium: Photographs.
Technical Standard: Good.
Comment: This second part of the series describes agriculture, industry, communications, education and general development in Netherlands New Guinea. Some of the photographs are very good and very effective, particularly those taken from the air. As in Part I, double frame is used and vertical and horizontal pictures are arranged together. Taken together, the two parts of this strip give a fairly comprehensive impression of Netherlands New Guinea and as such should be interesting to people in other parts of the Pacific. General.

NOTRE FRANCE: LES FLEUVES SEINE ET LOIRE. Produced by Editions Nouvelles pour l'Enseignement, Paris. Black and white. 32 frames. No captions or sub-titles. Printed commentary. Published price F.Met.frs.285.

Subject: The rivers Seine and Loire.
Medium: Maps and diagrams.
Technical Standard: Good.
Comment: The whole strip is composed of maps, in line and relief, tracing the course of the Seine, in the first section and the Loire in the second, from their sources to the sea. Accompanied by another strip, or series of photographs showing the physical features of the districts, this set of maps would be very useful, serving as a kind of projected atlas. At times the maps become rather complicated, particularly when showing the relationship of the main river to tributaries and other rivers, but with careful explanation the main subject should be clear enough. . . . . 12 + ages.

OCEANS, SEAS AND LAKES. Produced by Common Ground Ltd., London. Black and white. 29 frames. No captions. Teaching notes. Published price stg.16s.6d.

Subject: One aspect of physical geography.
Medium: Photographs.
Technical Standard: Good.
Comment: Like most of Common Ground's productions this one is carefully thought out, well prepared and well presented. The title covers a variety of the forms in which large areas of water have been classified—the open sea and coastal shores, icebergs and pack ice, straits, canals, archipelagoes, coral reefs, lagoons, lochs, glacial lakes, crater lakes, swamps and broads. Reference is also made to such activities and products as fish, fishing, transport and vegetation. 10 + ages.

PACIFIC PANORAMA. Produced by the London Missionary Society, London. Black and white. 64 frames. No captions. Teaching notes. Price A.12s.6d.

Subject: Views of different Pacific Islands where the L.M.S. has its stations.
Medium: Photographs.
Technical Standard: Mostly below average.
Comment: It is a pity that the technical quality of this strip is not better and that it is not better edited, for it is full of interesting pictures which would appeal to people all over the Pacific. It is essentially a strip to accompany a lecture and it is far too long for use at one showing. The notes are very discursive and sometimes seem to have little relation to the frames. Made into two parts, the material would be very interesting, for it includes scenes of life in New Guinea, the Gilbert and Ellice Islands, Trobriands, Papua, Samoa, Ocean Island and the Cook Islands. . . . . General.

*PAPER TEARING. Produced by Common Ground Ltd., London. Colour. 35 frames. Captions. Teaching notes. Published price stg.25s.

Subject: Paper pictures made by children.
Medium: Coloured photographs.
Technical Standard: Very good.
Comment: Paper tearing is used as a means of encouraging expression in children but, quite apart from its value in this connection, it produces very charming and colourful works of art. Briefly, the strip is arranged with one or two words in each frame with the picture, and the notes suggest that the strip be used as an aid for backward readers. The paper tear-outs in the film are delightful and show imagination and talent on the part of the children who made them. The notes are interesting and instructive. . Infant schools.

PROGRESSIVE PUPPETRY. Part I. Produced by Fralex Publications, Andover, Hants. Black and white. 30 frames. No captions. Teaching notes. Published price stg.16s.6d.

Subject: How to make glove puppets.
Medium: Drawings.
Technical Standard: Good.
Comment: This fascinating and practical little strip shows how to design and make puppets and, taken together with the teaching notes, the drawings should prove a useful guide to anyone who is enterprising enough to try to make them. The first section demonstrates "introductory puppets", which are made of paper and are more or less impressionistic in type; the second section follows on with "permanent puppets", which are more realistic, with modelled faces and properly made costumes. It is suggested in the notes that the different sections are more appropriate for different age groups and that the strip may, for that reason, be best used as two separate parts.
Section (i) 5 + ages.
Section (ii) 8 + ages.

ROUND WORM. Jet series. Produced by National Christian Council, India. Black and white. 15 frames. No captions or subtitles. Printed commentary. Published price A16s.9d.

Subject: How roundworm attacks the body.
Medium: Drawings.
Technical Standard: Good.
Comment: This is a particularly lively little strip, the stick figures are most graphic and animated and the tale of Etwar and his worms is clearly and briefly told. He eats fruit from the ground where roundworms have laid their eggs—also his long nails have infected dirt in them—he puts them in his mouth and soon the worms are thriving in his stomach. Because he does not use a latrine, his little sister soon becomes infected and so it goes on. Then Etwar learns how to stop the worms spreading and all is well. 12 + ages.

LA SAUTERELLE ET LA CIGALE. Les Invertébrés series. Produced by Editions Nouvelles pour l'Enseignement, Paris. Black and white. 40 frames. No captions. Printed commentary in French. Published price F.Met.frs.285.

Subject: Grasshoppers and cicadas.
Medium: Drawings.
Technical Standard: Good.
Comment: This strip is composed of very good drawings and is of a pleasant even quality but the treatment of the subjects is rather superficial and the notes are very brief. In the first section we are shown the grasshopper, cricket, locust, mole-cricket, earwig and praying mantis; in the second there are several frames devoted to the cicada, and these are followed by pictures of wood and water bugs, the green fly, the head louse and so on. . . 12 + ages.

TETANUS. Jet series. Produced by National Christian Council, India. Black and white. 22 frames. No captions. Printed commentary. Published price A.16s.9d.

Subject: Tetanus.
Medium: Drawings.
Technical Standard: Average.
Comment: The subtitle of this strip is "with special reference to newborn babies" and a number of the frames tell the melancholy story of a baby whose cord is cut with an unclean knife, by an ignorant midwife, and how he dies of tetanus as a result. The tetanus germ is shown throughout the strip as a little black animated stick which expresses joy at unhygienic conditions and gloom when people take such precautions as washing their hands, boiling instruments, cleaning cuts and sores. All the pictures are stick-figures, but they are full of life and movement. . . . . General.

WATER FOR A THIRSTY LAND. Produced by British Instructional Films Ltd., Surrey. Black and white. 14 frames. Subtitles. No captions. Printed commentary. Published price stg.5s.

Subject: Irrigation.
Medium: Photographs, diagrams.
Technical Standard: Good.
Comment: The photographs are good but the notes are extremely brief, being limited to a couple of words for each picture and a short outline of the subject in general. The theme is the ways, old and new, in which water is brought to land where it is needed, and if the user is able to enlarge on this sparse material the strip may prove useful, for the visuals are clear and concise. 8 + ages.

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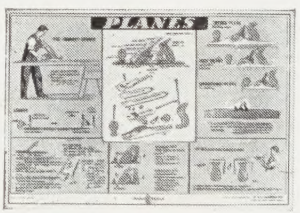

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The Ramakrishna Library

THE relatively large amounts being spent throughout the Pacific to-day on teaching people how to read is in rather curious contrast to the very small amounts available for providing them with anything to read when they have learnt.

This is not, of course, a purely Pacific phenomenon, for in most underdeveloped areas the administering authorities, while readily undertaking the obligation to promote literacy, have tended to assume that once this has been done, their duty is discharged.

Until recently, at least, the prevailing view was that the actual provision of literature to meet aspirations developed by the educational process could safely be left to commercial interests, philanthropic organizations, or, where they had developed far enough, to local government bodies.

Unfortunately, however, such services are largely non-existent in dependent territories and are therefore all the more worthy of encouragement when found. For it is becoming obvious that social and economic progress cannot go far without literature — whether informational, educational, or recreational.

In the Pacific region a praiseworthy attempt to make literature of all kinds available to the people of Fiji is being made under the aegis of the Ramakrishna Mission, by re-establishing the Ramakrishna Library at Nandi, with a branch at Tailevu.

Progress made since the opening of this Library in April, 1954, is encouraging. Despite inadequate accommodation, funds, and staff, accessions number 5,000, in English, Chinese and various Indian and Pacific languages, and the periodical list is probably the most comprehensive in the Commission area.

Apart from the main reference and loan collections, there are special services for students, children and hospital patients, a film section and an information centre, while a library of gramophone recordings is being planned.

The ambitious but commendable aim of the Ramakrishna Library is to provide a full library service for the whole of Fiji. A start has already been made by converting a command car into a makeshift travelling library. What is urgently required, however, is a small book-mobile fitted for showing visual media and, it is to be hoped, equipped to sell books as well as to loan them.

Fiji Society: Publication of Collected Papers

THE recent publication of Vols. II - IV of *The Transactions and Proceedings of the Fiji Society of Science and Industry*, covering the years 1940-47, and its successor the Fiji Society, for 1948-50, represents a major contribution to the literature of Pacific research. Assistance towards meeting the heavy printing costs involved in the undertaking was given by grants of £F.250 by the Government of Fiji and £stg.200 by the South Pacific Commission.

In common with other island scientific bodies, the Fiji Society has had its vicissitudes, but thanks to the devoted efforts of a small band of local enthusiasts it has been able to maintain a continuous existence since its foundation in 1938: no mean feat when one considers the ephemeral life of many learned societies in far larger centres. During this period it has been successful in attracting a remarkable series of papers on scientific and historical subjects relating to Fiji and other parts of the South Pacific.

These have now been collected in three volumes, containing a total of sixty papers on a wide range of subjects covering the natural sciences (botany, zoology, forestry, geology and meteorology), anthropology and history. For the most part they have been written by Fijian experts who have dedicated their lifetime to the study of local problems, among whom Parham on botany (seven papers), Derrick on history (seven papers), and Roth and Lester on anthropology (five papers) are, as one would expect, conspicuous; but a few are by visiting research workers such as Gifford, the archaeologist, and Milner, the linguist.

With remarkably few exceptions the level of contributions is high, and the Fiji Society is to be congratulated in preserving such a wealth of first-hand information on the Colony. Copies may be obtained for 25/- (Fiji currency) per volume, or three guineas the set, from the Society's Treasurer, Box 358, Suva, Fiji.

Vol. I of *The Transactions*, which is now out of print, was originally published in three parts, covering the years 1938, 1939 and 1940 respectively. It is proposed to reprint it shortly, and at the same time publish a Vol. V to include the papers for the period from 1951 to 1953.

PRINCIPAL COMMISSION PUBLICATIONS

Publications issued by the South Pacific Commission include the following:—

- *SPC QUARTERLY BULLETIN:*
  Annual Subscription ..... *8/-Stg.*
- *TECHNICAL PAPERS:* These are technical reports on a wide range of subjects in the economic, social and health fields (list on outside back cover).
- *OFFICIAL RECORDS: Proceedings of Sessions of the South Pacific Commission* (First to Twelfth); *Annual Reports of the South Pacific Commission* (1948 to 1952); *Reports on the First and Second South Pacific Conferences; Progress Reports on Action Taken on the Resolutions of the First South Pacific Conference.*
- *EXPERT REPORTS:* The Oxford University Press is publishing a series of Expert Reports in book form for the Commission. Four have been issued to date:

  VOCATIONAL TRAINING IN THE SOUTH PACIFIC. By R. A. Derrick, M.B.E., A.M.I.S.E., F.R.G.S. Mr. Derrick's report consists of a survey of the facilities for professional and technical training in the whole of the South Pacific, and of recommendations for future development.
  Price in Australia ..... *30/-A.*

  MOTURIKI: A PILOT PROJECT IN COMMUNITY DEVELOPMENT. By Howard Hayden. A fully documented, copiously illustrated report on a pilot project in community development carried out under Commission sponsorship on the island of Moturiki by the Government of Fiji.
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  SOCIAL ANTHROPOLOGY IN MELANESIA: A Review of Research by Dr. A. P. Elkin, Professor of Anthropology in the University of Sydney. In this report Dr. Elkin reviews past, present and future anthropological research in Melanesia, designed to advance native welfare.
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  SOCIAL ANTHROPOLOGY IN POLYNESIA: A Review of Research by Dr. Felix M. Keesing, Professor of Anthropology, Stanford University. This is a parallel study to Professor Elkin's report on anthropological research in Melanesia.
  Price in Australia ..... *27/6A.*
- *BIBLIOGRAPHY:* The following bibliography has been published for the Commission by Oxford University Press:

  A BIBLIOGRAPHY OF BIBLIOGRAPHIES OF THE SOUTH PACIFIC: Compiled by Miss Ida Leeson, former Mitchell Librarian. A basic catalogue arranged by area and subject.
  Price in Australia ..... *15/-A.*
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  The Construction of Literacy Primers for Adults: By Dr. K. Neijs ..... *5/-Stg.*
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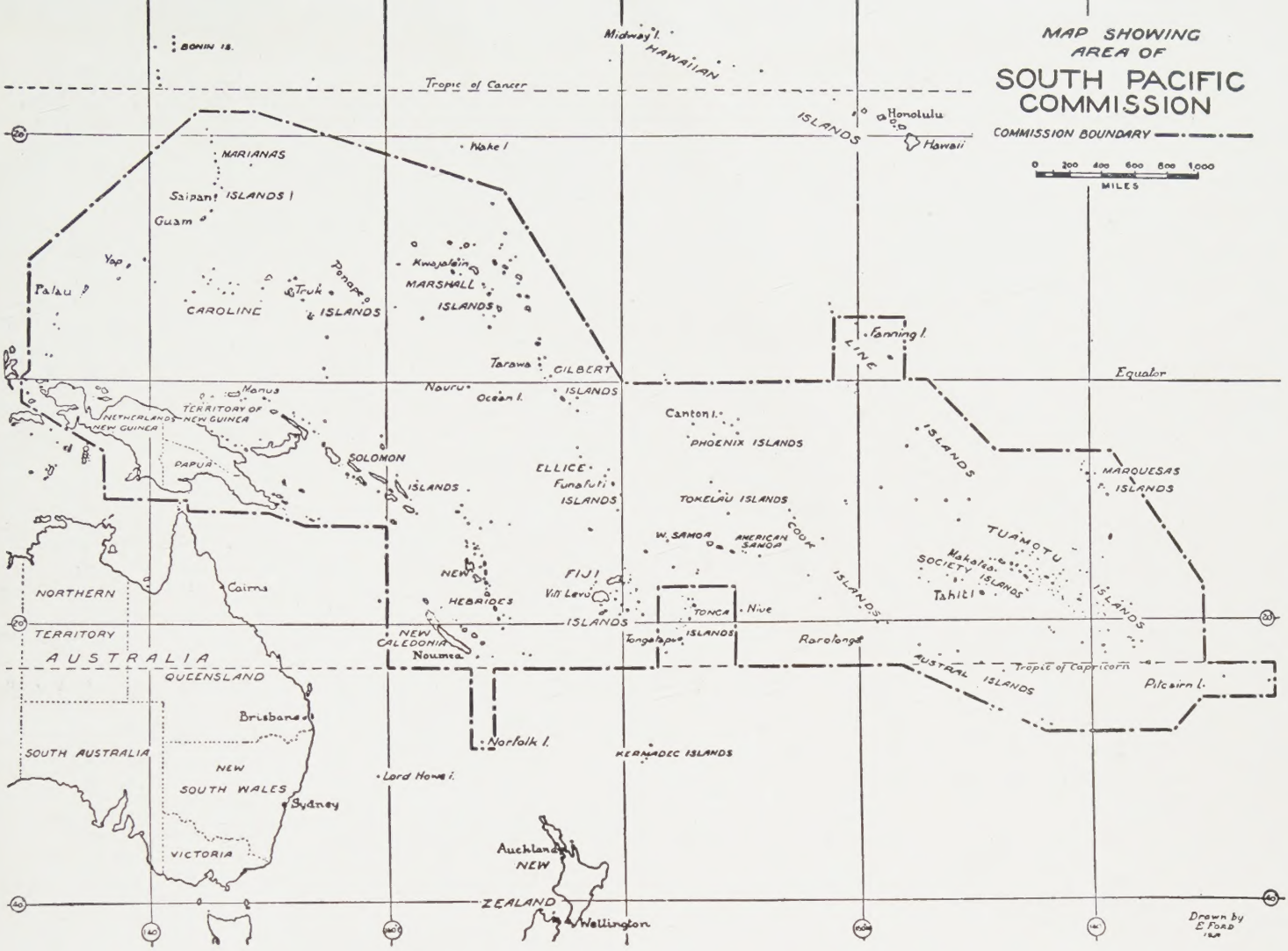
The above volumes are obtainable through leading booksellers.

INQUIRIES REGARDING COMMISSION PUBLICATIONS MAY BE DIRECTED TO THE SECRETARY-GENERAL, SOUTH PACIFIC COMMISSION, NOUMEA, NEW CALEDONIA, OR TO G.P.O. BOX 5254, SYDNEY, AUSTRALIA.



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15. **Libraries for Beginners.** Dr. and Mrs. Kenneth Todd, Kwato Mission, Eastern Papua. July 1951.
32. **Types of Organization in Adult and Mass Literacy Work.** D. R. Roberts, Organizer of Island Literature, South Pacific Commission. August 1952.
44. **The Use of the Vernacular in Teaching in the South Pacific.** G. J. Platten. June 1953.
47. **Central Vocational Training Institution.** F. J. Harlow. August 1953. (5/-. stg.; plans available sep., 5/-. stg.)
72. **Literacy Teaching for Adults.** Karel Neijs. November 1954. (5/-. stg.)
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OTHER SUBJECTS

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71. **Film and Filmstrip Catalogue.** September 1954. (3/-. stg.)
76. **A Bibliography of Tropical Housing.** January 1955.

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18. **Report on Nutrition Investigations by the South Pacific Commission in 1950.** November 1951.
22. **Chemical Composition of the Milk of New Hebridean Mothers.** F. E. Peters, biochemist, South Pacific Commission. February 1952.
23. **Nutrition Research Conducted in New Hebrides during 1951.** Sheila Malcolm, nutritionist, South Pacific Commission. April 1952.
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58. **Bibliography of the Nutritional Aspects of the Coconut.** F. E. Peters. April 1954.
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83. **Diet and Nutrition in the Trust Territory of the Pacific Islands.** Sheila Malcolm. July 1955.
85. **Etudes sur la Nutrition et l'Alimentation dans les Etablissements Francais de l'Oceanie** (Summary and Conclusion in English). Sheila Malcolm. April 1955.

PUBLIC HEALTH

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24. **A Survey of Leprosy on the Island of Nauru.** Dr. C. J. Austin, Director, Makogai Leprosy Hospital, Fiji. April 1952.
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MOSQUITO-BORNE DISEASES

17. **Conference of Experts on Filariasis and Elephantiasis, Tahiti: Summary of Proceedings.** September 1951.
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60. **Some Aspects of Malaria in the New Hebrides.** Dr. R. H. Black. May 1954.
61. **Malaria in the Trobriand Islands.** Dr. R. H. Black. May 1954.
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31. **Cocoa Plantation Management in Western Samoa.** D. R. A. Eden, General Manager, New Zealand Reparation Estates, and W. L. Edwards, Assistant General Manager. October 1952.
36. **Cocoa Growing in Fiji Islands.** D. H. Urquhart, former Director of Agriculture, Gold Coast. December 1952.
37. **Cocoa Growing in Netherlands New Guinea.** D. H. Urquhart. January 1953.
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9. **Report of Plant and Animal Quarantine Conference, Suva.** April 1951.
34. **Rhinoceros Beetle Control in the Kingdom of Tonga.** L. J. Dumbleton, Plant and Animal Quarantine Officer, South Pacific Commission. November 1952.
77. **A List of Diseases and Parasites of Animals Recorded in the South Pacific Territories.** Bilingual. December 1954.
78. **A List of Plant Diseases Recorded in South Pacific Territories.** Bilingual. December 1954.
79. **A List of Insect Pests Recorded in South Pacific Territories.** Bilingual. August 1955. (6/-. stg.)

CURRENT RESEARCH

5. **Fisheries and Animal Health Research Projects of Significance for the South Pacific Region,** conducted under the authority of the C.S.I.R.O., Australia. May 1950.
20. **Research Workers in the South Pacific** (now T.P. No. 52). December 1951.
29. **Current Research in the South Pacific in the Field of Economic Development.** July 1952.
43. **Research in Queensland in Tropical Plant and Animal Industries.** Jacques Barrau, Technical Officer, South Pacific Commission. May 1953.
52. **Social Science Research in the Pacific Islands.** December 1953. (Revised edition of Technical Paper No. 20.)

CO-OPERATIVES

1. **The Co-operative Movement in the Gilbert and Ellice Islands.** H. E. Maude. February 1949.
10. **Bibliography of Co-operation in the South Pacific** (Now T.P. No. 51) April 1951.
42. **The Co-operative Movement in Papua and New Guinea.** Prepared by the Registry of Co-operative Societies, Port Moresby. February 1953.
51. **A Bibliography of Co-operation in the South Pacific.** December 1953 (Revised Edition of Technical Paper No. 10.)
54. **The Pacific Islander and Modern Commerce.** V. D. Stace, Assistant Economist, Reserve Bank of New Zealand. March 1954.
75. **Catalogue of the Commission's Co-operative Library** (Bibliography of Co-operation). January 1955. (5/-. stg.)

COMMUNITY DEVELOPMENT

2. **Community Development.** March 1950.
11. **Interim Reports on the Moturiki (Fiji) Community Development Project.** Howard Hayden, Director of Education, Fiji. May 1951.
26. **Further Education in the Cook Islands.** P. F. Henderson, Officer for Further Education, Cook Islands. July 1952.
35. **The Purari Delta—Background and Progress of Community Development.** November 1952.
45. **The Nimboran Community Development Project.** Dr. J. van Baal, Director of the Bureau of Native Affairs, Netherlands New Guinea. June 1953.
46. **The Koror Community Centre.** Reports supplied by the High Commissioner, Trust Territory of the Pacific Islands. August 1953.
74. **Educational Aspects of Community Development.** R. Thomson. January 1955. (4/-. stg.)
84. **The Communities Project Approach to Economic Development.** H. Belshaw. July 1955.

EDUCATION

3. **The Village Library.** April 1950.
4. **Visual Aids in Education in the South Pacific.** A. L. Moore, Visual Aids Consultant. April 1950.
13. **Vocational Training Facilities in Australia for Students from South Pacific Territories.** May 1951. (Out of print.)

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